# FLIGHT and The AIRCRAFT ENGINEER

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# The Outlook

## Lord Beaverbrook's Statement

PROBABLY few people in this country ever wish to be peers, but those members of the House of Lords who attended the secret session to debate Lord Beaverbrook's statement on the Ministry of Aircraft Production must have spent a very interesting time. In debates of national importance the House of Lords often reaches a higher level of informed criticism than the wordy laymen of the House of Commons. Without knowing what was said at that secret session, the ordinary citizen is distinctly handicapped in forming an opinion on Lord Beaverbrook's account of his stewardship. Of course, our enemies suffer likewise.

Certainly there was much that is gratifying in the story told by the Minister of Aircraft Production. We are not much impressed by statements that the output of one month was two and a half times that of some previous month, for the latter figure may have been much too low. But it is cheering to be told that the R.A.F. had received from the United States and Canada nearly 1,000 assembled aircraft and that the Navy had recently received 95 aircraft and 326 engines. The former figure seems conservative, but in any case the receipts were the output of an infant industry, and when that industry reaches maturity its offspring will be vastly more numerous.

## Long-term Policy

IT is above all things the duty of the Ministry of Aircraft Production to take the long view, to decide priorities, and to arrange, not merely for a certain number of aircraft to be produced by a certain date, but that the right classes of aircraft are ready by the time when they are most likely to be needed. Aircraft are not just aircraft; they are bombers or fighters or reconnaissance machines or trainers, and so one cannot usefully say that two and two make four. The totals remain just two and two.

It must be admitted that piling up reserves is taking the long view. Lord Beaverbrook says that he has amassed 100 per cent. reserves, and aims at 200 or 300 per cent. One is a little inclined to wonder whether in this case the long view has not been overdone. Has the necessity of forming new squadrons, especially heavy bomber squadrons, or increasing the establishment of existing ones, been weighed sufficiently against the desirability of piling up reserves? The weight of R.A.F. night raids has been much increased of late, but there are distant targets which have only received one or two visits, and there are many in Eastern Germany which have never been bombed at all. In the short nights of summer long-range bombing can only be carried out by very fast machines, and the immunity of many targets in Eastern Germany, Poland, and other distant regions makes us wonder whether our aircraft production has been altogether wisely planned.

## Athens, Cairo, Rome?

THE warning issued by the British Government that if the enemy bombs Athens and Cairo the R.A.F. will retaliate by bombing Rome and continuing to do so until the end of the war, is a step which has no precedent in the present struggle. It is a step which shows that the British Government is distinguishing between the varying mentalities of Germans and Italians.

It has been suggested at times that London might

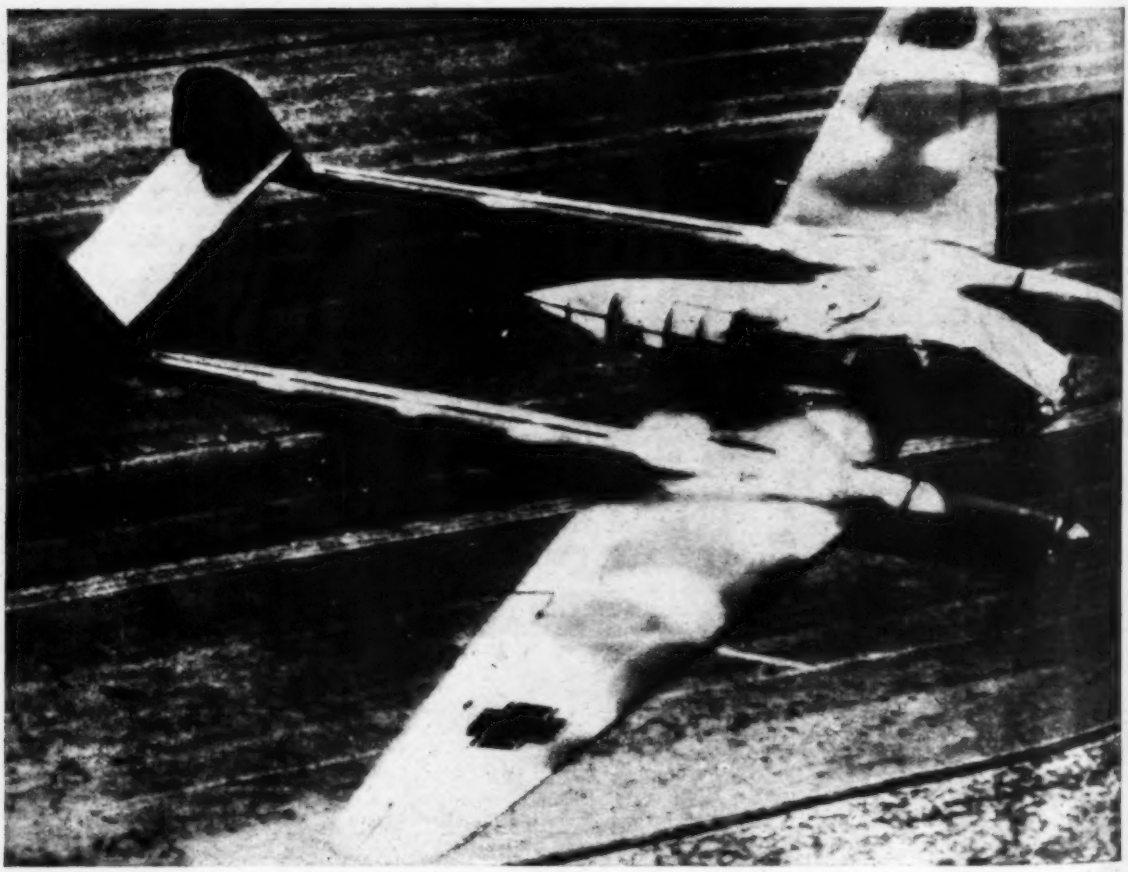
have been spared if a similar threat against Berlin had been published early in the war, but there is nothing in the character of Hitler or of the German people to support such a view. Hitler considers only force and power; the things of the spirit, such as art, beauty, history, or even the welfare of his subjects, mean nothing to him. The German people would probably have scoffed at such a threat. Had not their adored leaders assured them that hostile bombers could never penetrate the Berlin defences?

The Italians are different. A love for art in all its forms is part of their make-up. Even Mussolini, with all his grave faults, has done much for archæology. It might even be charged against him that out of the exiguous national revenue of Italy he has spent too large a proportion on archæology. So long as he controlled Italian operations in the Mediterranean no bombs were dropped on Athens—only on the Piræus. There cannot exist a true Italian who would not be horrified if the Parthenon were bombed, and likewise the thought of damage to the Roman Forum, the Colosseum, or the Arch of Titus would be abhorrent. Damage by bombs to any of these relics of the past would be equally detested by Britons. Rome has hitherto been left inviolate.

But Athens is not the only city in question. Cairo is included, and Cairo is also full of historical remains. Its defence is a particular British responsibility. It has come to pass that the enemy has occupied Athens, and so it will not be bombed; but Cairo may still attract the enemy bombers. In that case the threat to Rome remains. We must all hope that it will never have to be carried out.

## *Balloon Changes*

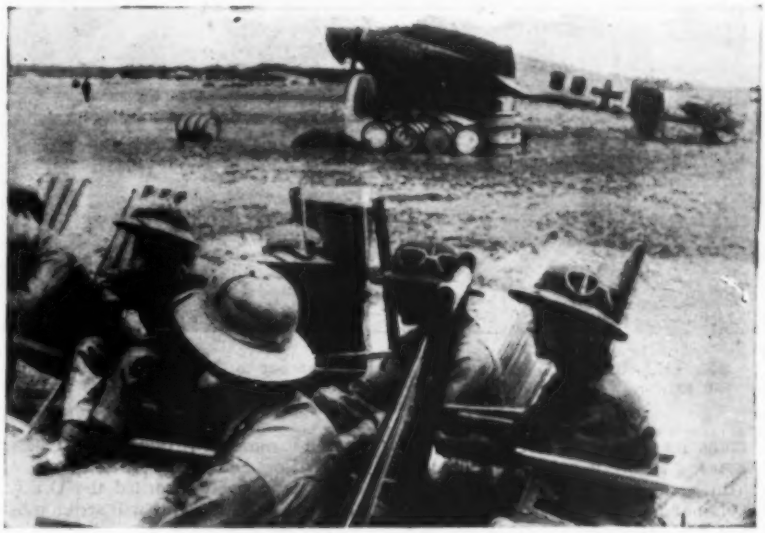
WOMEN of the W.A.A.F. are to be trained experimentally to take charge of posts of the Balloon Barrage. If the experiment proves a success and the women prove fit for such responsibilities, it will set free numbers of men for a more active share in the war. In summer the duties of the balloon posts may be monotonous, but surely have a pleasant side. On wintry nights those duties are a stern test of endurance and hardihood. The person in charge of the winch cannot keep warm by moving about; he (or she) must just sit still and bear the cold. Physical strength is not a necessity, but no little skill is needed when a balloon has to be hauled down in a tricky wind, fighting like a game fish. Where knack is the requisite, women may prove quite as good as men, or even better. But presumably men will be kept to man the machine guns at each post. We have not yet reached the point of asking our women to become Amazons.



**NAZI NOVELTY:** This is the Focke-Wulf Fw/189, said to be Germany's latest design of short-range, fighter-reconnaissance machine, the layout of which would certainly appear to have speed as the main idea. The picture reached this country via America.

# War in the Air

## *Inaccurate German Bombing: Heavy Attack on Tripoli: German Battle Cruiser Bombed in Brest Harbour*



THEIR PLACE IN THE SUN: German airmen wearing solar topis in Lybia.

THE overpowering of the heroic Greek Army by the combined forces of Germany and Italy is tragic in the extreme, but it was hardly unexpected. The little David could take on one Goliath, but not two. On the right of the Allied line a comparatively small force of Empire troops from the United Kingdom, Australia and New Zealand fought with equal courage, and were handled with consummate skill by Lieut.-General Sir Maitland Wilson. Constant retirements with a sting in one's tail are among the most trying of military operations. In this campaign it was made all the more trying by constant rain and by the incessant bombing by German aircraft. When R.A.F. Hurricanes could get at the Junkers and Messerschmitts the issue was never in doubt, but the Hurricanes could not be everywhere. There were all too few of them. None the less, the German bombers did not interfere at all seriously with the movements of our troops and supply columns either up to the front or back to the reserve lines. In an order of the day Lieut.-General Sir Thomas Blamey, who commands the Australian troops, remarked: "The withdrawal was continually harassed by the enemy air bombing along all the roads. Our losses through all this have been extraordinarily light, and we have learned how very inaccurate aerial bombing is." Men who came through the Norway campaign said the same; that dive-bombing has great moral effect but does very little actual damage.

Despite the inaccuracy of the German bombing, it caused a great deal of annoyance to our men and some delay in movement when vehicles had to work round craters in mountain roads. The cry went up from our soldiers for more Hurricanes. Naturally, as at Dunkerque, the infantry and tank men seldom saw the good work which the few Hurricanes there were doing. It has to be admitted that this was the third campaign during this war in which a British army has been left short of fighters. In this case the reason was, doubtless, difficulties of transport from Great Britain, not shortage of supplies, but the result was none the less unfortunate. Of course, the numbers at the command of Sir Arthur Longmore are strictly limited, and those still in Africa are busily employed.

On one day there was a great air battle over Athens which lasted nearly all day. It is not reported that the enemy were trying to bomb the Greek capital and its priceless memorials, but were attacking shipping in the Piraeus. British fighters shot down twenty of them, and ground fire added two more, one by rifle fire as a Junkers dived too low.

There has been another fine example of co-operation between the Navy and the R.A.F. Tripoli has become a thorn in the side of our diminished forces in Northern Africa. During one night the bombers of the Air Force and those of the Fleet Air Arm attacked the harbour. On the way there machines of the Fleet Air Arm intercepted five German troop-carrying aircraft and shot four of them down in flames. About 10 tons of bombs were dropped on the harbour. Before dawn the Fleet, which included three battleships, opened fire on the harbour. In 42 minutes the warships fired 553 tons of shells into the place, many salvoes coming from the 15-inch guns of the battleships. Later air reconnaissance showed that destroyer berths had been hit and one destroyer badly damaged, five merchant ships burnt out, and at least four others set on fire. Great damage to important buildings was also done.

The Fleet had been cruising for three days before this bombardment, and during that time the Fulmars of the Fleet Air Arm (doubtless from H.M.S. *Formidable*) shot down two Cant shadowing aircraft, two Ju 88s, and badly damaged a Dornier flying boat, in addition to the troop-carriers mentioned above. They lost one fighter themselves.

With such exciting events happening elsewhere, one is apt to forget Malta. The Germans do not, and they have been raiding it regularly. It is amazing how pluckily the population is standing up to its ordeal. Fortunately, the place is well provided with strong shelters; built, if memory is right, by the Knights of St. John. Last week there was a particularly vicious night raid, and night fighting has not yet been highly developed on the island. The damage to buildings was considerable, but casualties were light. By day the Hurricanes on the island deal faithfully with the raiders and have taken heavy toll. The people of London and of many other British cities can and do sympathise with the Maltese in their sufferings.

The Germans have taken over a small piece of *Mare Nostrum*. The Germans have sent men in small boats from Kavalla or some other place on the Thracian coast and landed on the islands of Samothrace and Lemnos. The latter island figured in the Dardanelles expedition of the last war, and R.N.A.S. units landed there; but they were equipped with armoured cars, not with aircraft. The Ger-

OFF THE RECORD : A few hints being handed out to German fighter pilots on the joys of a forced landing in the Western Desert. Note the Me 110s in the background.

mans may try to use the place as a *point d'appui* if ever they come to attack the Straits, but they have not command of the sea, and the troops landed there could certainly be cut off from the mainland and reduced by the Royal Navy, if such an operation were ever thought worth while.

The conquest of Abyssinia continues to go well. The last Italian force turned and offered battle outside Dessie, the last important place held in Ethiopia by the late conquerors. The defensive position is strong, but the Empire forces have the inestimable advantage of command of the air. The air observers can map all the defensive points, and the bombers can attack them. There is good reason to hope that the bomb-aiming of the South Africans and Rhodesians will prove more accurate than that of the Germans in Greece, and certainly the Italian troops, many of them Africans, will not stand up to it so stoutly as the Anzacs and British troops did.

### Success at Brest

SO, after some weeks of wondering, we have at last been told officially that a direct hit with an extremely heavy bomb has really been made on either the *Scharnhorst* or the *Gneisenau* in Brest harbour. This very welcome news was not given out by any of the fighting Ministries or the Ministry of Information as a separate item, although its prompt publication would have cheered all British people, their Allies, and their American helpers. They had begun to think that air-bombing of a harbour was a rather futile affair, and to lose confidence in the bomb, the only weapon which can be used to strike at an enemy who holds most of the Continent. The news was allowed, so to speak, to leak out in the citation in the *London Gazette* which announced that Pilot Officer G. R. Ross and Sergt. K. I. Street had been respectively awarded the D.F.C. and the D.F.M. This will strike most people as a strange way of handling war propaganda.

This bombing success must have an appreciable effect on the Battle of the Atlantic, for these two German warships have the power to do immense harm to shipping, and may have been responsible for some of the harm which has been done. Only powerful units of the Royal Navy could tackle them with success. Recently they have been described in broadcasts and in the *London Gazette* as "battle cruisers." The last issue of *Brassey's Annual* gives them as "battleships." Each has nine 11-inch guns as well as secondary armament and is supposed to carry two aircraft. The top speed is given as 27 knots. The thickness of the armour is not given. These ships have succeeded to the names of the two German cruisers sunk by Admiral Sturdee's squadron in the Battle of the Falkland Islands—surely not a good augury. The present ships have had varied careers. The *Gneisenau* was claimed by the Norwegians as having been sunk by them during the German invasion of their country. The *Scharnhorst* was shortly afterwards engaged by H.M.S. *Renown* off the coast of Norway and was said to have been hit at extreme range; but in the heavy weather she outsteamed the British battle cruiser (whose speed is supposed to be 29 knots) and ultimately got into Kiel dockyard for repairs. While there the R.A.F. tried hard to bomb her, but she must have escaped crippling damage.

At last one of these two has been seriously damaged, and it is quite possible that the other has also been hit. If they had been able to move out of such a bombed area as Brest harbour, they would surely have done so before now. But the number of harbours in which German warships can come in from the Atlantic for overhaul is certainly limited. One of the two was in dry dock at Brest, which means that the overhaul needed was not in the

## WAR IN THE AIR (Continued)

THE JUNK SHOP : Unloading field equipment from a Junkers Ju 52 transport machine in North Africa.

## WAR IN THE AIR (Continued)

**ENEMY AIR LOSSES TO APRIL 26th**

| | Over G.B. | Over Continent | Middle East |
|---|---|---|---|
| April 20 | — | 1 | 25 |
| " 21 | 2 | 2 | 2 |
| " 22 | 1 | — | 11 |
| " 23 | 2 | — | 8 |
| " 24 | 2 | — | 4 |
| " 25 | 1 | — | 2 |
| " 26 | 2 | 2 | 1 |
| | 10 | 5 | 53 |

Total in Northern Area : 4,446. Total in Middle East about 1,450.

nature of "running repairs." The one hit by the "extremely heavy bomb" will certainly be out of action for a considerable time to come—and she may be hit again.

Naval, military and air strength are closely bound together in this war, and so it is of interest to all Services to hear that the battleship H.M.S. *Prince of Wales* is now in commission. She will relieve the pressure in many directions, and from that the R.A.F. will benefit. Incidentally the new warship carries four aircraft.

British Army anti-aircraft guns have destroyed over 1,000 enemy aircraft since the beginning of the war. The total has been brought to this figure by recent successes in the Middle East, notably at Tobruk. It includes only certainties and takes no account of damaged aircraft which have crashed unobserved on the way home.

Five hundred enemy aircraft have been definitely shot down by anti-aircraft gunners in the British Isles and many others have been destroyed in Malta and the Middle East.

### The Prime Minister's Broadcast

ALL listeners throughout the Empire, and in all friendly lands, must have been much cheered by Mr. Churchill's latest broadcast. He never minces matters when a situation is grave, but he does put the various phases of the war in true perspective. He pointed out that no enemy success anywhere else will lose the war for us if we can win the Battle of the Atlantic. Perhaps not everyone had previously realised how important was the decision of President Roosevelt to send out his "neutrality patrol" of warships and flying boats far into the Atlantic. Mr. Churchill laid due stress on its importance, pointing out how it would enable us to concentrate our own naval and air forces far more than hitherto on the actual guarding of the merchant ships which bring us the food and arms which we need from the continent of North America. When it is a matter of patrol rather than of actual striking power, aircraft are of supreme importance, and the long-range flying boats of the U.S.A. Navy will be an immense help to us in defeating the U-boat. Once we know where the danger lies, we can take appropriate action. The strength of the U-boat consists in its power of hiding. When it is deprived of that power it is much less dangerous. The Prime Minister also cheered his hearers by pointing out the superiority of the British Empire *plus* the United States over Germany in population, in productive capacity, and particularly in the manufacture of steel. He looked forward to the day when Britain would have far more aircraft than the enemy can muster.

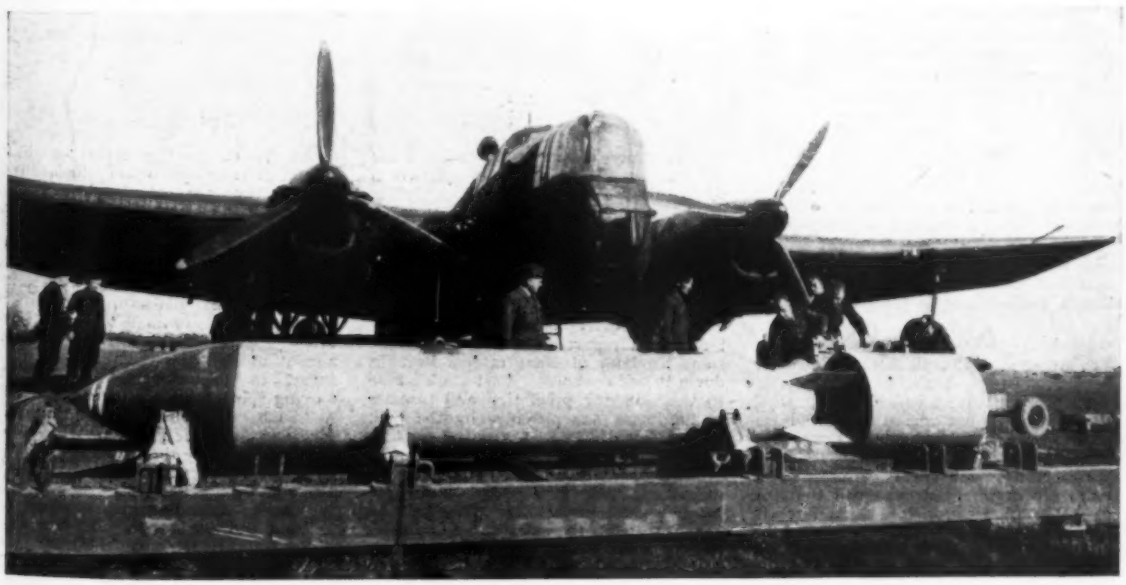
**BRITISH AIR LOSSES TO APRIL 26th**

| | Over G.B. | | Over Continent | Middle East |
|---|---|---|---|---|
| | Aircraft | Pilots | Aircraft | Aircraft |
| April 20 | — | — | 4 | 9 |
| " 21 | — | — | 1 | — |
| " 22 | — | — | 1 | 5 |
| " 23 | — | — | 1 | 3 |
| " 24 | — | — | 3 | — |
| " 25 | — | — | — | 1 |
| " 26 | 2 | 2 | 7 | — |
| | 2 | 2 | 17 | 18 |

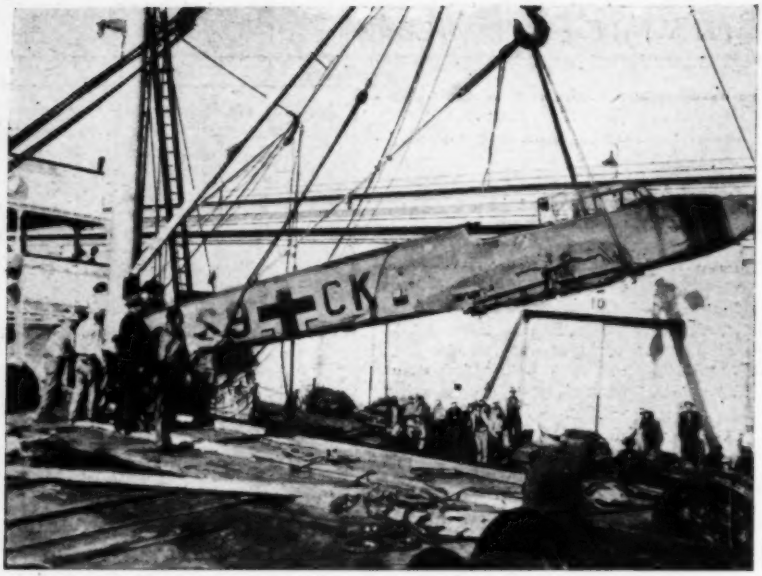
Total in Northern Area, 1 895. Middle East about 182.

After Berlin, Hamburg tasted the new-type British bombs, and the destruction wrought by them in its dock area and round about was quite amazing to even experienced night-bombing pilots of the R.A.F. It is to be hoped that they destroyed much material which the enemy had intended to use in the Battle of the Atlantic, or prevented its production.

Another batch of airmen has arrived in this country from Canada, products of the Empire Training Scheme. It was the largest batch which has arrived up to date. It included a number of American pilots who will probably be used for ferry work



**To make a clean Brest of it? A 2,000lb. bomb awaiting stowage aboard an A. W. Whitley. Whether this is one of Lord Beaverbrook's "beautiful bombs" or just a "big bomb" is not revealed.**



**INNOCUOUS INVADER. A Messerschmitt Me 110 has "invaded" U.S.A. but in an innocuous state of helplessness as shown here, where its fuselage is being swung ashore from a ship's deck. Brought down in England, it has been sent for the American aircraft experts to examine.**

# HERE AND THERE

### R.A.F. Want Pianos

HAVE you a piano in playable condition you aren't using much? If so, the nearest R.A.F. station would probably be only too glad to have it, because an appeal has been issued by the R.A.F. Comforts Committee for such instruments. But you are not asked to borrow a handcart and trundle it round to the camp yourself. Just tell the committee at 20, Berkeley Square, W.1, and they will arrange to collect it and hand it over for you.

### Photographic Air Mail

TO reduce the weight of air mail to be transported to our troops in the Balkans and Middle East, a photographic method will soon be introduced. The sender will write his message on a form measuring 11in. by 8in. which will then be photographed on a miniature film for despatch by aeroplane. At the destination a 5in. by 4in. enlargement will be made and placed in an envelope with the address showing through a transparent panel. The possibility of weight reduction will be realised when it is known that half-width standard 35 mm. ciné film is used.

### Don't Touch

IF an enemy aircraft comes down in your district don't go near it.

Such is the advice which the Air Ministry offers. It has offered similar advice before, on the air and in the Press, but the response leaves much to be desired.

Going near an enemy aircraft is a risky business. First, you run the risk of being blown up, for these aircraft frequently contain unexploded bombs and other explosive material which, in the past, have often injured nearby persons and sometimes caused their deaths. Secondly, if the temptation to get hold of a souvenir from a German aeroplane proves irresistible, you run the risk of being prosecuted under defence regulations and fined, or even put in prison. Thirdly, if you remove anything at all, even though it be something which appears of no consequence whatever, you run the risk of depriving your country not only of salvage but of valuable information too.

### Dominion Liaison

AIR COMDRE G. O. JOHNSON, Deputy Chief of the Canadian Air Staff, and Air Comdre. N. R. Anderson, Air Officer Commanding, Eastern Air Command, have come to England for a period of attachment to the Royal Air Force. Air Comdre. Johnson will be attached to the staff of the Chief of Air Staff, and Air Comdre. Anderson to the staff of Air Officer Commanding, Coastal Command. These officers are being sent to Britain with a view to gaining as much knowledge as possible of those recent developments in operational methods used by the Royal Air Force, which might be adapted later to the Royal Canadian Air Force in Canada.

### British and Dutch Co-operation

THE spirit of friendly co-operation which has aways existed between the British and Dutch airlines is shown most strikingly in the interchange agreement which has been reached between British Overseas Airways, Qantas Empire Airways, K.N.I.L.M. and K.L.M. Under this agreement passengers booked by any one company may return by any other on journeys between Lydda (Palestine) and Sydney. No additional cost is incurred. This will be welcomed by passengers as it gives them so much more flexibility.

### Production in New Zealand

NEW ZEALAND, with its small population of 1½ million, has no aircraft manufacturing industry, but a decision has now been reached to commence the production of aircraft spares as these are becoming increasingly difficult to procure from abroad. Applications are being called for from personnel qualified in such work and the posts include a director of production, production officers, chief draughtsmen and draughtsmen.

## UNSECRET WEAPON

THE American news magazine *Time* has an interesting paragraph which relates the principle by which a certain device, covered by U.S. patent, works:

"Last December, as London lay almost helpless under Nazi air attacks by night, Air Chief Marshal Sir Hugh ('Stuffy') Dowding predicted with mysterious confidence, 'Night bombing will be greatly reduced by spring.' Since then repeated reports have come from England of Nazi raiders brought down in full darkness. Last week a clue to this amazing prediction and promise of fulfilment was provided by the U.S. Patent Office.

"It granted to Joseph Lyman, of Huntingdon, N.Y., a patent for a machine which uses radio beams to locate a plane in darkness or fog, plot its course through the skies on an indicator like a television screen. Anti-aircraft fire can thus be directed, it is thought, with even more accuracy than in present daylight firing.

"Lyman's device uses very short radio waves (of 600 megacycles—or about 50 centimetres from trough to trough of the radio wave) which can be focused by parabolic reflectors into beams. (The shorter the waves the better they can be focused.)

"Directed into space, the beam will bounce back if it hits metal. Lyman's device rapidly combs the skies with directed beams, picks up reflected signals with a co-ordinated parabolic receiver. Returning signals are shown by a spot of light in a cathode ray tube (heart of television receivers). The moving spot charts the course.

"Such signals do not distinguish defending from attacking planes. So A.A. men must be sure the dark sky is clear of their own planes before opening up. Presumably the device is also adaptable for use by defending planes, which can feel out the murk with radio beams co-ordinated with their machine guns.

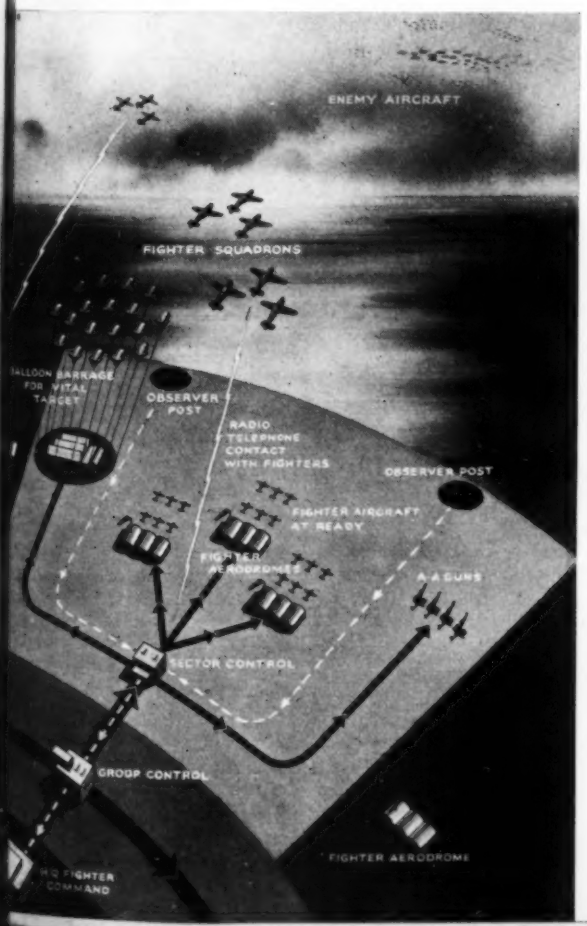
"Joseph Lyman's invention was supposed to be a big secret. But details were still available to anyone at the U.S. Patent Office this week, while *Science Service* discussed it."

# THE BATTLE of BRITAIN

## Diagrammatic Illustrations of Last Year's Great Air Battle

*IN the following pages we give passages and diagrams from the illustrated edition of the Official Account of the Battle of Britain. This resumé is but the bare military bones of an heroic stand. The excerpts have been specially selected to meet the need of the military student.*

THE illustrated edition of the "Battle of Britain" was published on April 23rd, 1941, and doubtless many of our English readers will have already seen it. The story is epic, and no harm can come of its re-telling. It is re-told here mainly for the benefit of the many thousands of our readers overseas who would not normally have access to copies. It is safe to say that there is scarcely an air force mess in the world in which *Flight* is not read, and it is felt that this important section of our readers will want the tactical details of the greatest air battle of all time—the air battle in which the much-vaunted, and so-called invincible, German *Luftwaffe* received such a punishing that they threw up the sponge after three months' fighting. Obviously we cannot reprint the whole thirty-six pages of the official Air Ministry account, but the salient points have been extracted in order to give a fairly complete picture The period covered extended from August 8th to October 31st, 1940, and the attack was made in three definite phases. If, however, the tapering-off of the unsuccesstul attack is considered separately, then this makes a fourth and last phase



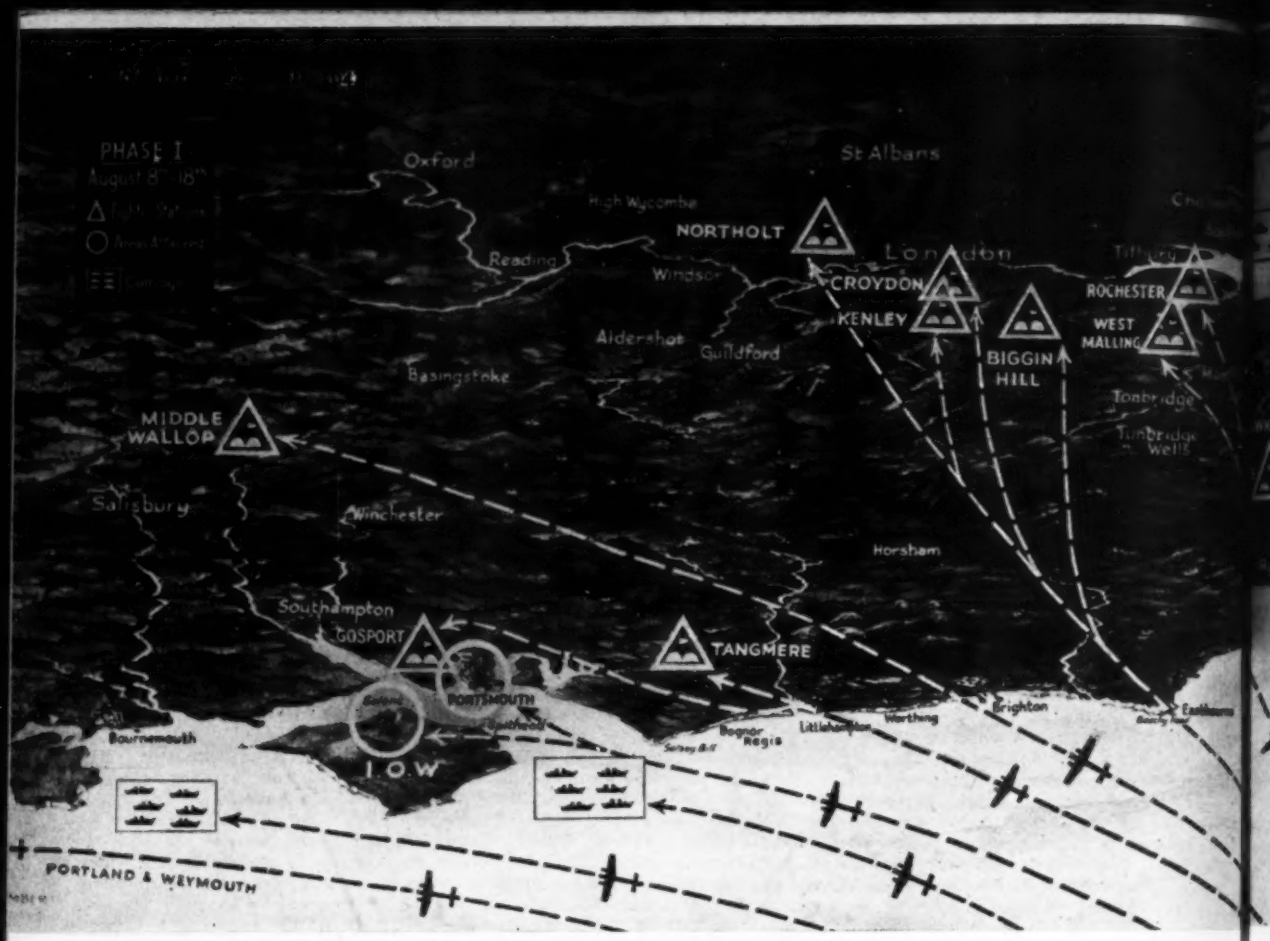

By the time dusty August had arrived what was the history of the *Luftwaffe's* work? Warsaw, without fighter defence, had been bombed into submission. Rotterdam, without fighter defence, had been bombed into submission. France, without adequate fighter defence because her work-people thought more of the freedom to make more money than of the machines to make more freedom, had also been bombed into submission. The battle opened with the Germans on the crest of the wave and undoubtedly expecting to give England the *coup de grace*. The official account gives a very clear description and diagrammatic illustrations of the elements of our defence. This must be carefully studied in order to appreciate the actual battle story which comes after. After pointing out the impossibility of maintaining standing patrols round the whole of our coast, the process of defence is thus outlined:

### Defence System

Information regarding the approach of the enemy is obtained by a variety of methods and is co-ordinated and passed to "Operations Rooms." The coastline of Britain is divided into Sectors each with its own Fighter Aerodromes and Headquarters. These Sectors are grouped together under a conveniently situated Group Headquarters, which in its turn comes under the general control of Headquarters, Fighter Command. The information about enemy raids is illustrated by various symbols on a large map table in Group and Sector Operations Rooms, the aim being to give each "Controller" the same picture of the progress of raids in his particular area. In addition to this the Controllers have all possible information set out before them, such as the location and "state" of their own Squadrons, the weather and cloud conditions all over their area. They are also in touch with Anti-aircraft Defences and Balloon Barrages.

Squadrons are maintained at their Sector Aerodromes at various "states of preparedness." The most relaxed state is "released," which means that the Squadron is not required to operate until a specified hour and that the personnel can be employed in routine maintenance, flying training and instruction, organised games, and that in some cases they may leave the Station. Next comes "Available," which means the Squadrons must prepare to be in the air within so many minutes of receiving the order. "Readiness" reduces this to a minimum and is the most advanced state normally used. Occasionally "Stand-by" is employed, which means that the pilots are seated in their aircraft, with the engines "off," but all pointing into wind

**OPERATIONS CONTROL: A pictorial representation of the elements constituting the air defence of Great Britain.**




ready to start up, and take off, the moment the leader gets his orders from the Controller.

In good weather conditions and when there is reason to anticipate an attack, squadrons are perforce kept at a high state of "preparedness" which is relaxed as much as possible when the weather deteriorates. The broad principle is usually to keep one part of the force at "Readiness," a second part at "Advanced Available" and a third at "Normal Available." When the attack develops, the "Readiness" Squadrons are ordered off in appropriate formations and the "Available" Squadrons are ordered to "Readiness" and used as a reserve to meet a second or a third attack or to protect aerodromes or vulnerable points such as aircraft factories.

### Controller's Task

These orders are issued by the Controller whose function it is to study the Operations Room Map and put a suitable number of aircraft into the air at selected points to intercept the oncoming raids, or to cover vulnerable points. His duty also is to keep a constant watch on his resources so as not to run the risk of being caught by a third or fourth wave of raids, with all his squadrons on the ground "landed and refuelling." It must be remembered that the endurance of a modern fighter aircraft, if it is to have ample margin for full throttle work, climbing and fighting, is limited. Allowance must also be made for the journey back to the parent station, especially if visibility is bad.

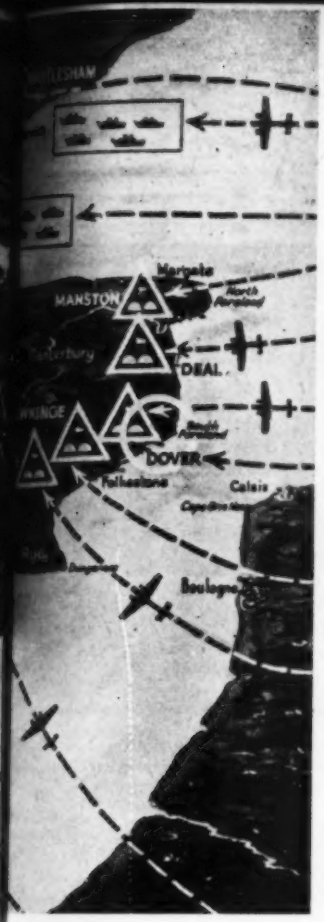
With the tracks of the enemy raid and of his own fighters both before his eyes, the Controller's task of making an interception is in theory a comparatively simple mathematical problem. He is in constant touch with his fighters by radio telephone, is able to give them orders to change course from time to time, so as to put them in the best position for attack.

Once the fighters report that they have "sighted the enemy," the Controller's task is over, except that he may have to give them a course to bring them back to their aerodromes when the battle is over. The "enemy sighted" signal, the "Tallyho," is at once transmitted to Group H.Q. and recorded on the Squadron state indicator. The Red Letter day for any Group was on September 27th, when, in No. 11 Group, 21 Squadrons out of 21 ordered up were able to report "enemy sighted."

*Phase* 1. August 8th-18th. The machines employed were mostly Ju 87's, He 111's, Do 17's and Ju 88's, with fighter escorts of Me 109's and Me 110's in unwieldy formations 5,000ft. to 10,000ft. above the bombers they were protecting. In all, twenty-six raids were made during these ten opening days.

Commencing on August 8th two convoys were fiercely attacked, one of them twice. Sixty enemy aircraft in the morning and more than a hundred soon after mid-day, deployed on a front of over twenty miles, tried to sink or disperse a convoy off the Isle of Wight. They succeeded in sinking two ships. In the afternoon at 4.15 more than a hundred and thirty appeared over another convoy off Bournemouth. This they were able to disperse but they lost fairly heavily in doing so. The enemy renewed the assault three days later, choosing as his targets the towns of Portland and Weymouth, as well as convoys in the Thames Estuary and off Harwich. In these attacks

## THE BATTLE OF BRITAIN (Continued)




he relied greatly on dive bombers, which proved no match for our Hurricanes. Nevertheless some damage was done both in Portland and Weymouth. This may have encouraged him, for on August 12th, early in the morning, he launched about two hundred aircraft in eleven waves against Dover. Shortly before noon a hundred and fifty more of the enemy attacked Portsmouth and the Isle of Wight.

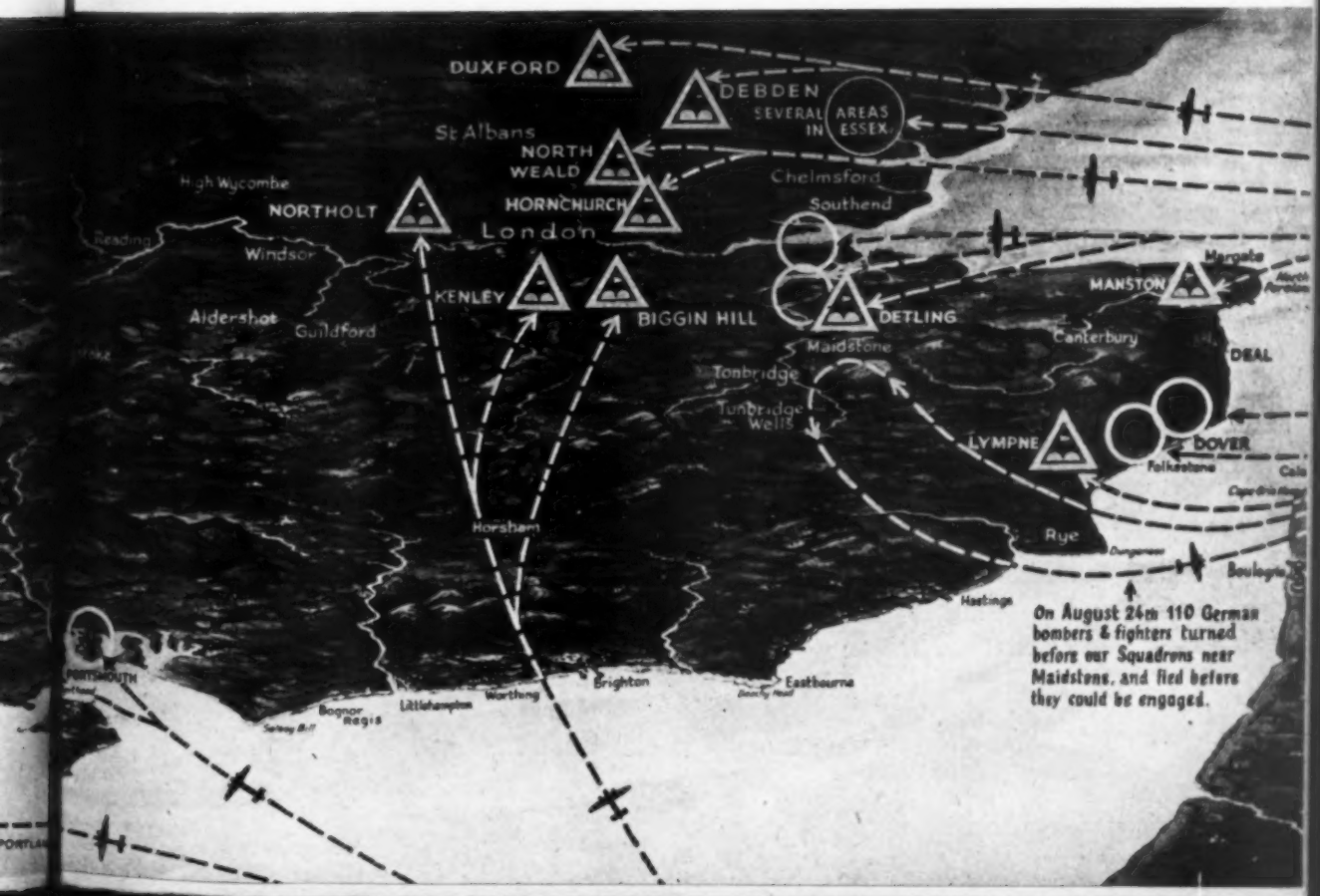
German losses at this stage were 182 aircraft. The 13th and 15th saw renewed heavy attacks on Portsmouth employing between three hundred and four hundred aircraft.

By this time, however, the enemy began to feel the strength of our fighters and turned the weight of his attack on their aerodromes. In this attack, on August 15th alone, 180 German machines of all types were destroyed and in the ten days of the whole phase they lost 697 aircraft against our 153. Sixty of our pilots were safe. Generally speaking, the German tactics were to make feint attacks on objectives near the coast to draw off our fighters and to follow up with the main attack 30 or 40 minutes later in the hope that our machines would be refuelling. The Me 109s and 110s were attacked from the rear because they were not, at that time, armoured.

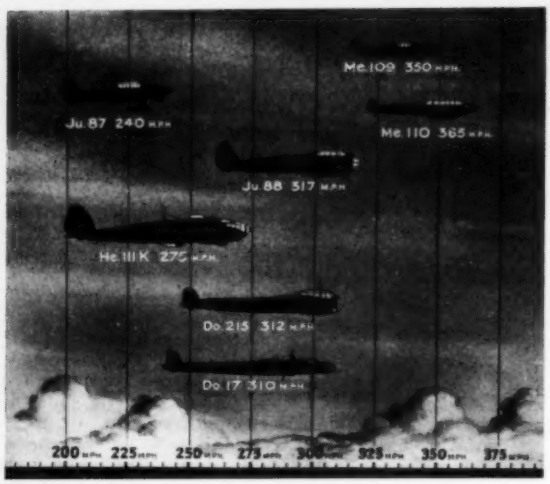
*Phase* 2.—August 19th to September 5th. The first five days constituted a breathing space for the *Luftwaffe*, but between August 24th and September 5th thirty-five major attacks were made on inland fighter aerodromes and aircraft factories. The main attack was now delivered on a wider front. Enemy tactics were also changed. The number of escorting fighters was increased and the size of bomber formations reduced. The covering fighter screen flew at very great heights. Enemy bomber formations were also protected by a box of fighters, some of which flew slightly above to a flank or in rear, others slightly above and ahead, and yet others weaving in and out between the sub-formations of the bombers. This type of formation succeeded on several occasions in breaking through the forward screens of our fighter forces by sheer weight of numbers and in attaining their objectives even after numerous casualties had been inflicted. On other occasions smallish formations of enemy long-range bombers deliberately left their fighter escort as soon as it had joined battle and proceeded towards South or South-West London unaccompanied. They suffered heavy casualties when engaged by our rear rank of fighters.

Eight hundred aircraft were used in a most determined effort to destroy or temporarily put out of use the aerodromes at Kenley, North Weald, Hornchurch, Debden, Lympne, Detling, Duxford, Northolt and Biggin Hill.

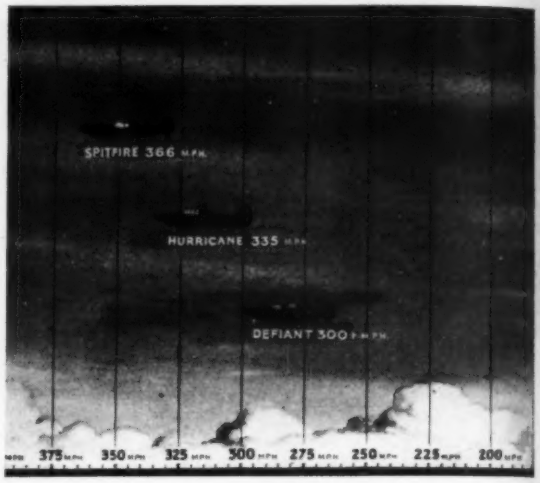
There were three heavy attacks on September 1st, five on 2nd, one on 3rd and two on 4th and 5th. One of the attacks on the 2nd got to within ten miles of London, but most of them were once again directed against fighter aerodromes. This was the last of the thirty-five main attacks delivered in this phase. They cost the Germans five hun-



## THE BATTLE OF BRITAIN (Continued)




**ATTACK: The seven different types employed by the enemy are shown in relation to their top speed.**




**DEFENCE: Three fighter types of the Royal Air Force bore the brunt of the fighting. The comparison of their speeds with those of the Germans is interesting.**

dred and sixty-two aircraft known to have been destroyed. Our own losses were two hundred and nineteen aircraft, but a hundred and thirty-two of the pilots were saved.

From August 8th to September 5th inclusive, no fewer than 4,523 Fighter Patrols of varying strength in aircraft were flown in daylight, an average of one hundred and fifty-six a day, and, despite the attacks, the operations of our fighting squadrons were not interrupted.

*Phase 3.*—September 6th to October 5th. This phase, which might have been called the Battle of London, consisted of no fewer than thirty-eight major attacks by day. In these fresh efforts the German escort of fighters gradually increased until the ratio was four fighters to one bomber. On many occasions bombs were jettisoned before the objective was reached as soon as contact was made with our fighters. After battering away morning, noon and night throughout September 6th against our inland fighter aerodromes, the German Air Force made a tremendous effort on the 7th to reach London and destroy the docks. Three hundred and fifty bombers and fighters flew in two waves east of Croydon up to the Thames Estuary, some penetrating nearly as far as Cambridge. They were met over Kent and East Surrey, but a number broke through and were engaged over the capital itself. London did not emerge unscathed. Damage was inflicted on dock buildings, on several factories, on railway communications, on gas and electricity plants. It was also inflicted on the enemy. One hundred and three German aircraft were destroyed. These heavy casualties shook the German High Command, for, though the attacks were renewed and continued, evidently all was no longer well. Still, the *Luftwaffe* persevered with great tenacity and courage, delivering heavy attacks on September 9th, using on that occasion a number of four-engined bombers; on the 11th, when about thirty aircraft penetrated to Central London; on the 13th, and again on the 15th. Those who got through on the 11th were so savagely handled by our fighter defence that the losses among their crews were estimated to be not fewer than two hundred and fifty. On the next day a single German aircraft penetrated the defence by the clever use of cloud cover and bombed Buckingham Palace in the morning. On September 15th came the climax; five hundred German aircraft, two hundred and fifty in the morning and two hundred and fifty

**FOUR GERMANS: (top left) The Daimler Benz engined Dornier Do. 215 which is a development of the Dornier Do. 17 shown in the bottom left hand corner. Between them is the Junkers Ju 87 (Stuka) dive bomber and below, on the right, is the Heinkel He 111 in which the bombs are stowed vertically.**

## THE BATTLE OF BRITAIN (Continued)

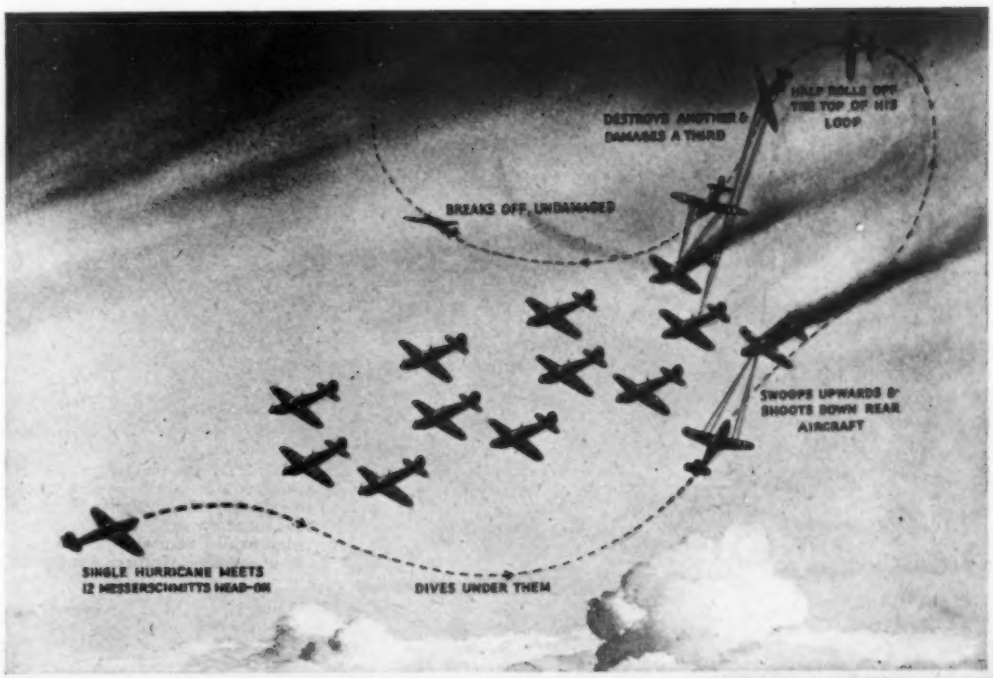
**NUMBERS : An artist's impression from the illustrated edition of the "Battle of Britain" depicting the enormous fighter screens employed by the enemy. Their very size made them too cumbersome to manœuvre.**

in the afternoon, fought a running fight with our Hurricanes and Spitfires from Hammersmith to Dungeness, from Bow to the coast of France. It cost the enemy one hundred and eighty-five aircraft known to have been destroyed. Altogether, between September 6th and October 5th he had lost eight hundred and eighty-three aircraft.

In this phase the Germans used high-altitude fighter screens, with the bombers, escorted by more fighters, 6,000ft. to 10,000ft. below. The high-flying fighters usually appeared a few minutes before the bombers. The object was evidently to draw off our fighters, exhaust their petrol, and thus make it impossible for them to engage the bombers.

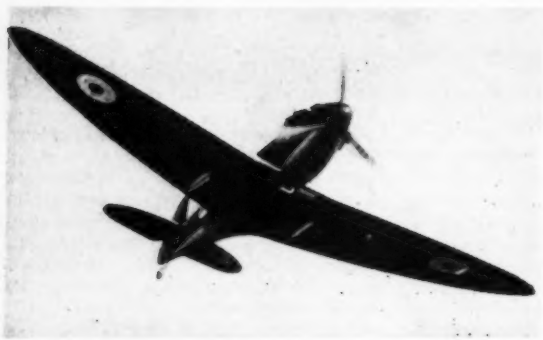
The enemy's high fighter screen was engaged by pairs of Spitfire squadrons half-way between London and the coast, while wings of two or three Hurricane squadrons attacked the bombers and their escorts before they reached the fighter aerodromes East and South of London. Other squadrons formed a third and inner ring patrolling above these aerodromes forming a defensive screen to guard the southern approaches to London. These intercepted the third wave of any attack and mopped up the retreating formations belonging to earlier waves.

The percentage of raids intercepted increased, as did the casualties of the enemy, while our own steadily decreased. Thus on September 27th No. 11 Group destroyed ninety-nine German aircraft, out of a total for the day of one


DESTROYS ANOTHER & DAMAGES A THIRD
HALF ROLLS OFF THE TOP OF HIS LOOP
BREAKS OFF, UNDAMAGED
SWOOPS UPWARDS & SHOOTS DOWN REAR AIRCRAFT
SINGLE HURRICANE MEETS 12 MESSERSCHMITTS HEAD-ON
DIVES UNDER THEM

**LONG ODDS : The method employed by a single Hurricane when attacking an escort sub-formation of twelve Messerschmitt 109's.**

## THE BATTLE OF BRITAIN (Continued)



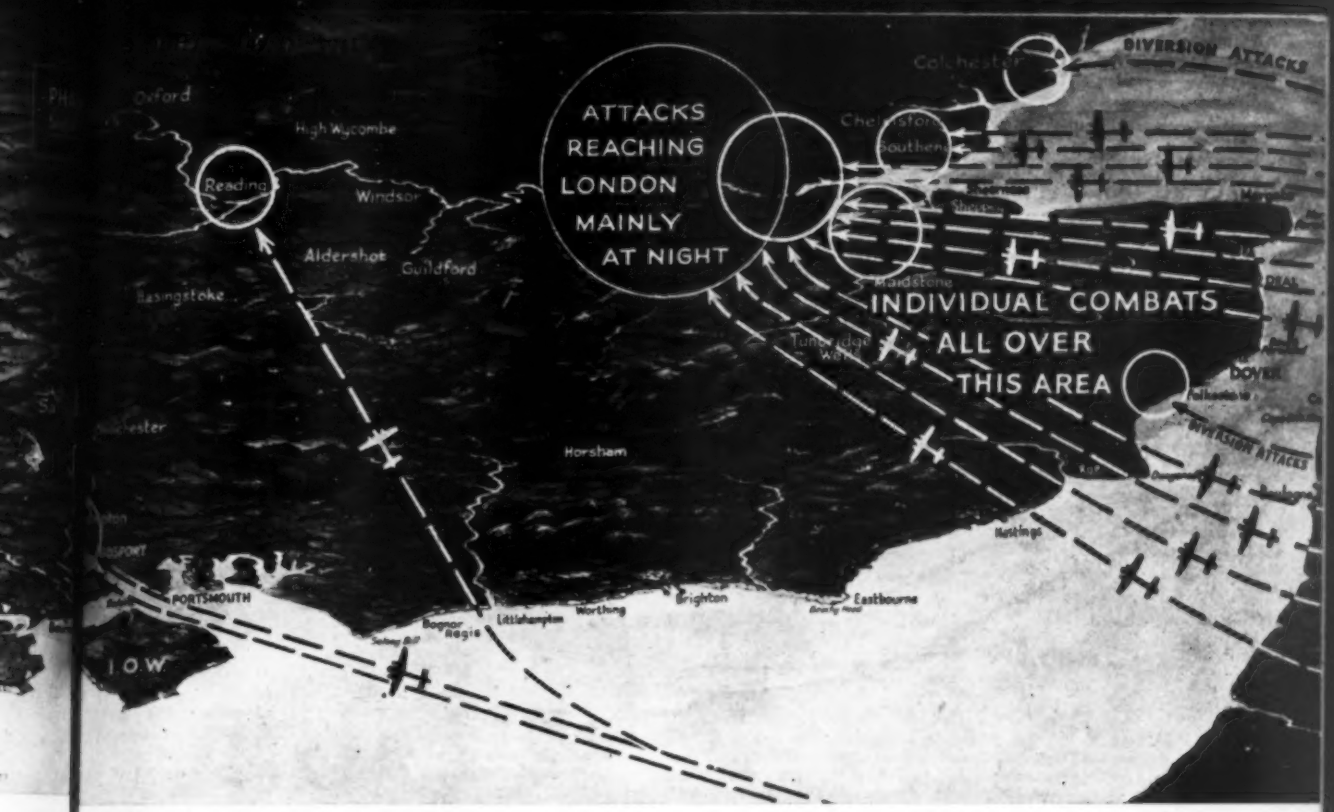
**THREE FIGHTERS:** (Left) The twin-engine Me 110 which was employed as a fighter-bomber in the later stages of the battle. Next, the Hawker Hurricane, which had already done such excellent work in France, and its eight-gun compatriot the Spitfire. All of our fighters were equipped with Rolls-Royce Merlin engines.

hundred and thirty-three, for the loss of fifteen pilots, a proportion of six and a half to one. Three days later, when thirty-two enemy aircraft were destroyed, the proportion rose to sixteen to one, and on October 5th only one pilot was lost though twenty-two of the enemy were shot down.

From September 8th to October 5th inclusive, 3,291 day patrols of varying strengths were flown, and from October 6th to the last day of that month 2,786, making a total for these fifty-five days of 6,077.

*Phase 4.* October 6th to October 31st. These twenty-six days saw a gradual cessation of the battle, and represented in fact a face-saving acknowledgment of defeat by the enemy. From the outcome of the previous phase it is obvious that the increased ratio of fighters to bombers had not achieved its object. The Germans, therefore, fitted their fighters with external bomb racks and protected these fighter-bombers with even more fighters. The majority of the fighter-bombers were Me 109s and their escorts Me 110s. Their ordinary bombers were withdrawn from the day battle entirely and employed more and more for the night bombing of London, by which it was hoped to make up for the day failure.

**VARIETY:** On the left at the bottom is the Defiant two-seater fighter which is now employed at night, and above this is the Messerschmitt Me 109. The Me compares very unfavourably with the sleek lines of the Spitfire. The twin-engined bomber with diving brakes down is the Ju 88—one of the best machines the Germans have produced.




Mass fighter formations were sent over at a great height in almost continuous waves to attack London, still the principal target. It was doubtless hoped by this means to wear out our fighter defence by forcing it to engage, at much higher altitudes, aircraft which were making the best use possible of high cloud cover. In the early stages he reduced the size of his formations, and used flights of from two to nine aircraft. Evidently, however, this new plan did not achieve the success for which he hoped, for in the third week of October he reverted once more to large formations flying at 30,oooft. or higher. To enable them to break through, the Germans continued to use the tactics of diversion. Whenever the weather was good enough waves of fighters appeared almost continuously over the South-East of England. Using the cover these provided, very high-flying fighter-bombers made frequent and rapid attacks on the London area. On sighting our fighters, however, they often jettisoned their bombs and made off.

### Finale

Our own tactics were immediately altered so successfully that No. 11 Group accounted for one hundred and sixty-seven enemy aircraft in three and a half weeks. The cost to the Group was forty-five pilots. In this phase the number of enemy probably destroyed rose considerably, because the fighting took place so high up that our pilots were unable to see the ultimate fate of many of the German aircraft which fell away after the encounter towards the sea. The physical strain of fighting at heights of 30,oooft. or more proved very severe.

Occasionally an odd Me 109 of a small formation broke through and reached London, but the weight of the bombs which they succeeded in dropping was only a fraction of what had been dropped in August and September. Moreover, there was little attempt at precision bombing.

There can be no better proof of the enemy's failure than that furnished by the citizens of London. During the early stages, many of them took cover when the sirens sounded. Very soon, however, it was noticed that most of the noise, at no time to be compared with the nightly barrage which soon became the background of their slumbers, was due to gunfire and not to the explosion of bombs. Trails of white vapour forming fantastic and beautiful patterns in the summer sky were often the only indication that the *Luftwaffe* was over the capital. These pleased the eye and provided a subject for speculation in the streets and public resorts.

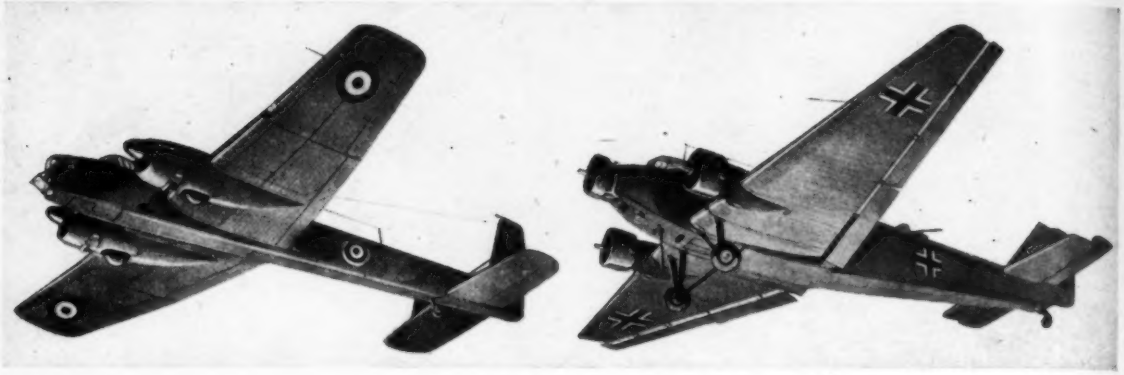
During the whole battle the Germans killed 1,700 people and wounded 3,360. They are known to have lost 2,375 aircraft at least. The Royal Air Force in its glorious fight lost 375 pilots killed and 358 wounded.

*The Illustrated Account of the Battle of Britain was published on April 23rd, 1941, price 6d. It may be had from His Majesty's Stationery Office or any bookseller.*

**COMMONPLACE : For three months this was a sight frequently seen in the countryside of Britain.**

# FRIEND or FOE?

## *British Bomber and German Paratroop Carrier : The Whitley and the Junkers Ju 52*

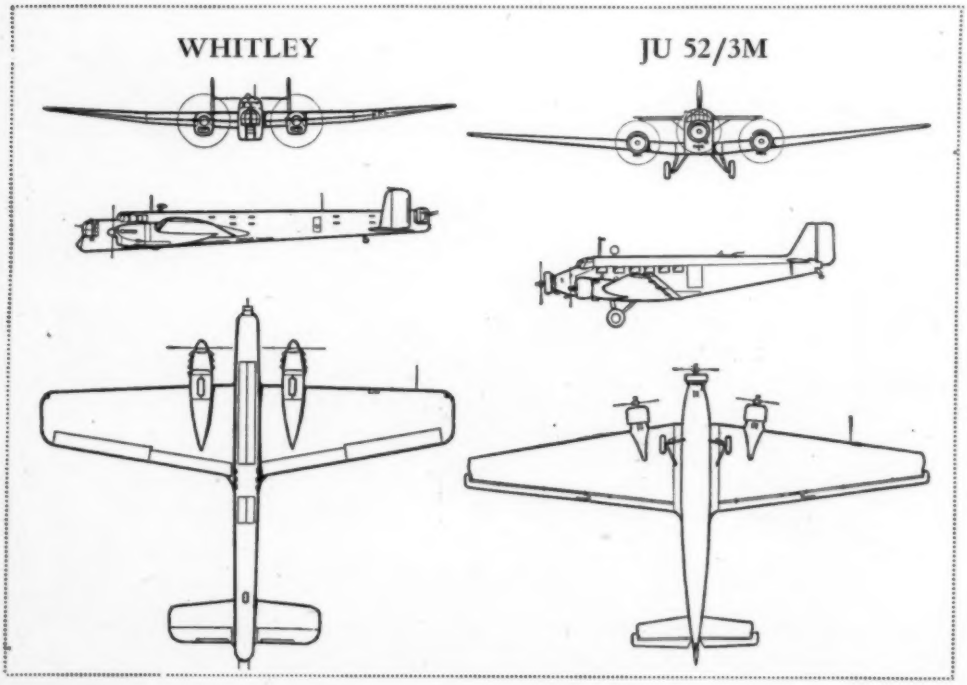


**A.W. Whitley.** Thick mid-wing, dihedral from roots, slight taper, square tips. In-line engines with beard radiators. Long, rectangular fuselage, gun-turrets nose and tail. Wheels retract into nacelles. Twin, strut-braced fins and rudders.

**Junkers Ju 52.** Low-wing, dihedral from roots, pronounced taper on both edges to small square tips. Slotted flaps. Three radial engines. Deep, straight-sided fuselage ; gun-position above, aft of amidships. Fixed undercarriage. Large square-cut fin and rudder.

WITH the exception of one or two comparatively obscure German and Italian types which are unlikely to trouble the spotter, those enemy aircraft which could be directly compared with parallel British and American machines, either from the point of similarity in appearance and/or operational duties, have now been dealt with. The series will continue, therefore, with a selection of other allied and hostile aircraft, not previously described, which, while not calling for actual comparison, may at any time require to be promptly identified.

The Armstrong Whitworth Whitley and the Junkers Ju 52 shown this week fall into this general category ; they bear little external resemblance and their primary functions are different, the former being one of our biggest bombers (excluding certain new types just coming into service), while the latter is now used only as a military transport and for dropping parachute troops. There is no doubt that the original civil air-liner version of the Ju 52 was designed with a view to its ultimate conversion to a bomber, and it was widely used on many Continental air routes. Then, in 1935, the military version equipped the newly formed bomber squadrons of the *Luftwaffe* and was extensively employed in the early days of the Spanish Civil War. It was superseded well before the present war began, and was used by the hundred for the transport of troops and supplies during the invasion of Norway and for the dropping of parachute troops when the Low Countries were overrun. It is almost certain that this machine, which has great load-carrying capacity and slow landing speed, is now being used to transport troops and supplies to North Africa, and, in the event of an attempted invasion of this country, would most probably fulfil similar functions—or at any rate try to!




To return to the Whitley, this aircraft is almost too familiar and too distinctive in appearance to need much description. In the air it has the unique characteristic of appearing to fly nose down, and its long, rectangular fuselage is instantly recognisable. Its mid-wings are very thick at the roots and taper moderately to broad, square tips. Earlier models were fitted with Tiger radial engines, but the current edition, which is more than 70ft. in overall length, has Rolls-Royce in-line engines, with beard radiators, which project well forward of the leading-edge in underslung nacelles. The nose, which projects so far

## FRIEND OR FOE? (Continued)

forward as to set the wings almost amidships, has an angular transparent "chin" with a power-driven gun-turret immediately above. The tailplane is approximately rectangular and the rear gun-turret projects well clear of the large strut-braced fins and rudders.

So far as the spotter is concerned, the appearance of any three-engined machine should send his finger straight to the alarm button, for only Germany and Italy have any such aircraft in service to-day. It seems unlikely that the slow speed and limited ceiling of the Ju 52 would enable it to penetrate very far inland unless under cloud cover, but if seen in plan its wings will be observed to taper sharply on both edges to small square tips and to be fitted with slotted ailerons and flaps. As the two outboard radial engines are fitted squarely on the tapering leading edge, they "toe out" from the axis of the engine on the nose. The fuselage is typical of the air-liner of several years ago with its straight sides and line of square cabin windows. The strut-braced tailplane has a straight taper to its leading edge, its balanced elevators projecting at the tips, and the angularity of the fin and rudder is relieved from complete squareness by a slope on the leading edge. The fixed undercarriage is attached below the centre-section (the short engine nacelles being almost entirely above the wings), and although wheel spats were originally fitted, photographs of Ju 52s operating during the present war show them to be devoid of this little refinement. The retractable "dustbin" under-turret, which was fitted when the machine was used as a bomber, is no longer present, but the open gun-position above the fuselage, midway between trailing-edge and tail-plane, is still retained to give some measure of defensive action. The metal covering to wings and fuselage is of corrugated alloy sheet.

*Next week: Saunders-Roe Lerwick and Dornier Do. 24.*

# THE LIQUID-COOLED ENGINE

### *A Reply to John Lee : The Merits of the 20-cyl. Multibank*

By JOHN W. MORRISON

MR. JOHN LEE'S paper, "Air-cooled v. Liquid-cooled Aircraft," in *Flight* of March 20th, 1941, has been well presented and very carefully thought out, but I find it unconvincing and, in certain respects, grossly misleading. One can prove anything with figures; one can likewise disprove anything.

America has made tremendous strides in the design orientation of the air-cooled radial engine both in the direction of increased power and the reduction of drag. The Pratt and Whitney "Double Wasp" engine, with its take-off power rating of 2,000 b.h.p. for a volume of 45.957 litres and a diameter of 52in., is an outstanding example of the progress that has been made. Not so very long ago, the possibility of exceeding 400 m.p.h. with an air-cooled radial-engined aircraft seemed remote; now, the new Pratt and Whitney engined Vought-Sikorsky fighter is claimed to be the fastest of all American aircraft with a speed appreciably in excess of 420 m.p.h.

Even Germany has not altogether abandoned the air-cooled radial The B.M.W. Flugmotorenbau have been manufacturing Pratt and Whitney engines under licence for a number of years, and, apparently, a German version of the "Double Wasp" is being installed in one of Germany's new fighters. The fact remains, however, that the vast majority of the German air force is supplied with liquid-cooled engines. In so far as we in Britain are concerned, even the largest 2-row 18-cylinder radial engine cannot hope to compete with our new liquid-cooled in-line engines in power output, speed and all-round efficiency. In designing new engines, our principal concern must inevitably be the potential power of the new 24-cylinder in-line German engines. Thus far, Jerry has contented himself with comparatively low power per litre from his engines, relying on a large swept volume to provide the necessary output. The maximum engine speed has been 2,300 to 2,400 r.p.m., and this low speed has been ascribed to the petrol injection system that sets a limit to the r.p.m. However, with a volume per cylinder approaching 3 litres, there has been plenty of scope for higher output, and the most recent Daimler-Benz engine is apparently rated at 1,500 to 1,700 b.h.p.

The *potential* output of the new German engines having a swept volume of up to 70 litres will be 3,000 to 3,400 b.h.p. This output is 50 per cent. greater than that of the most powerful radial. Even should Germany have abandoned the standard bore dimension of 150 mm. for a smaller one, it is hardly likely that the 18-cylinder radial will produce any more power. The B.M.W. 116 inverted V-12 water-cooled advanced trainer engine with a bore and stroke of 130 mm., may form the basis of an X or H-24 cylinder engine of 41.41 litres with an output of up to 2,000 b.h.p. at 20,000ft. Below is given a 2,000-h.p. engine study:—

| Type and Cooling | Number of cyls. | Bore and stroke | Volume (litres) | Crank-shaft length | Power/litre and/sq. in. p.s. |
|---|---|---|---|---|---|
| A. 2-row rad. air ... | 18 | 6¼" × 6¼" | 59.75 | 22" | 33.3 & 3.79 |
| B. 4-row rad. air ... | 20 | 5¾" × 6¼" | 53.19 | 28½" | 37.6 & 3.85 |
| C. X in-line air ... | 24 | 5¼" × 5½" | 43.50 | 52½" | 45.9 & 4.04 |
| D. H in-line liquid ... | 24 | 5¼" × 4½" | 40.44 | 75½" (2) | 49.4 & 3.85 |
| E. X in-line liquid ... | 24 | 5¼" × 5½" | 43.60 | 40½" | 45.9 & 4.04 |
| F. W in-line liquid ... | 24 | 5¼" × 4½" | 41.50 | 50½" | 48.2 & 3.85 |

In the above study, all the engines are assumed to be capable of delivering 2,000 b.h.p. at high altitude, the precise height being dependent on the type of supercharger. With an exhaust-driven turbo-blower the power would be available at 26,000ft., and with 2-stage blowers from 20,000 to 22 000ft. The power available for take-off is set at 2,300 b.h.p., which is slightly in excess of that of the most powerful 2-row radial. To avoid any misleading tendency, power per litre and per square inch of piston area are included side by side. The figures have been compiled from a searching analysis of all high-duty engines, the particulars of which have been released within recent years. In those instances where cylinder dimensions are the same as for engines that have been released, the dimensions are considered the best possible when everything is taken into consideration.

Mr. Fedden dealt very briefly with the 20-cylinder multi-bank engine some years ago. The projected Bristol engine —an illustration appeared in *Flight*—had o.h. camshafts and it was dismissed on the score of weight. Personally, I never could see why this should be so when compared with the 2-row radials. In so far as sleeve valves are concerned, I submit the 20-cylinder engine is incomparably more attractive than the 2-row 18 and lighter than the X-24. The position of the ports in a sleeve-valve engine is

## THE LIQUID-COOLED ENGINE (Continued)

nearer to the crankshaft axis than with poppet valves; so much so that, in the case of an 18-cylinder engine, the problem of getting the mixture to the front row of cylinders becomes critical. The problem of disposing of the exhaust gases forward from the rear row is impossible without violent twisting of the exhaust stacks. In any 18-cylinder engine, the axes of the cylinders are considerably farther apart than in a 14; with sleeve valves, the distances would be in the order of a foot.

By direct contrast, the breathing of a 20-cyl. multi-bank engine with sleeve valves is simple to arrange and power losses are at a minimum. So generous is the amount of space between the five banks of cylinders that the engine can be treated as five 4-in-line engines for cooling purposes. With reverse-flow cooling and a short extension shaft the engine could be completely cowled; with normal cooling both the carburetter and oil-cooler intakes might be contained within the diameter of the cowling. Complete inertia balance is achieved with at least two different types of quintuple conrod assemblies, with or without a built-up crankshaft. A score of cylinders is about the optimum number for 2,000 b.h.p. with air-cooling; general accessibility and ease of maintenance, together with an appearance of extreme simplicity, are compelling attractions.

The X-24-cyl. in-line and possibly the 24-cyl. multi-bank are alternatives. In the case of the X, some form of flexible drive is indicated for very high powers; the lengths of both crankshaft and valveshafts are getting out of hand with a figure higher than in a W-24 liquid-cooled engine.

### A Classic Example

The H is the classic 24-cyl. engine, more especially with liquid-cooling. It is gratifying indeed to realise that we originated the H-24, which has an all-round technical merit that makes it comparable to the V-12. All credit to Major Halford for his longsightedness. The maximum depth of the H-24 engine, Design D, is 43in., and the cowled width about 33in. In other words, the geometrical design of the engine fits the aeroplane.

It's "all my eye and Betty Martin" for Mr. John Lee to say that the plane must fit the engine. What about the Airacobra? Surely those figures tabulated in *Flight* next door to Mr. Lee's article prove the fallacy of his argument. The Caribou is heavier and less powerful than the Vanguard, yet the latter is 50 m.p.h. slower. The Caribou needs an altitude rating of only 1,000 h.p. for 400 m.p.h. Why not a jazzed-up, beefed-up, souped-up version of the Caribou with any of the liquid-cooled engines I have suggested? The W-24 would give a low transmission line.

In the second instalment of Mr. Lee's paper Fig 9 shows a pursuit aeroplane having a speed of 483 m.p.h at 25,000ft. on 2,000 b.h.p. In this instance the radial is inferior because primary shaft lengths depend on (a) fuselage width, (b) air-screw diameter, and (c) single or double engines. A liquid-cooled H-24 double engine within the fuselage would lop a yard off total primary shaft lengths. In this respect it is unique; it may even with advantage operate as two opposed 12s. The reduction in the length of the primary shafts will wellnigh halve their weight and throw Mr. Lee's tables out of gear.

It is well known that the stroke governs to an overwhelming degree the physical dimensions of any engine. In the H-24 the stroke can be reduced to a very low figure with advantage, if desired; the depth of the engine can be made equal to a V-12 of half the power. The range of possible bore/stroke ratios is greater than in any other engine, and the ease of mounting is unapproached when the potential power output is borne in mind. The maximum possible power is obviously higher than in any of the engines in my study.

At first sight it would appear that the liquid-cooled X-24 will be considerably lighter than the H by virtue of the fact that there is only one crankshaft, but it must be borne in mind that weight is governed not only by crankshaft length but to a large extent by inter-cylinder-distance and stroke/conrod ratio, which are at a minimum in a liquid-cooled H—say, .7in. and 1/1.7in. respectively. Now, let us assume that we propose to run four conrods on to one crankpin, which may be only 2¼in. long, using one master-rod and three link-rods. With a 4¾in. stroke and with the angles between link-pins the same as the angles between cylinder banks, the maximum angularity of the link-rod opposite the master-rod will be 30 degrees—nearly double that of the master-rod. The bearing area of the link-pins will be totally inadequate; 90 degrees rotation of the crankshaft will not bring the link-rods of the banks at right-angles to the master bank on to top-dead-centre due to the angularity of the master-rod.

With inertia balance thrown out and inertia torque variation the X is hardly an attractive proposition. By adding only ¼in. to the inter-cylinder-distance the total block length would be increased by almost a foot; sufficient to cancel out any weight advantage. Obviously, the key to a successful design is found in the correct quadruple conrod assemblies, all of which act about the crankpin axes. More than a decade and a half ago a famous engineer patented an X-16-cyl. engine without link-rods. This was made possible by doubling the length of the crankpins to accommodate two master-rods side by side, thereby permitting four rods to act on to one crankpin, but the design was unattractive for the reason that the inter-cylinder-distance was increased by more than 300 per cent.

Assuming that expense is no consideration, one can set about the design of a seven-bearing crankshaft with heavy counterweights opposite each crankpin with six master-rods and 18 auxiliary-rods, the whole making an assembly of a complexity calculated to stagger the imagination. I have no hesitation in saying that the realisation of the optimum X-24-cyl. aero-engine design is a monumental undertaking. The problems to be surmounted are legion if zero inertia torque variation and complete inertia balance are to be realised together with a close pitching of the cylinders.

### Two Installations

Let us now consider installations of designs A and F in the Consolidated 31 flying-boat. The total engine installation weights will be 9,200 lb. for A and 9,950 lb. for F, giving specific weights of 2 lb/b.h.p. for A and 2.163 lb./b.h.p. for F. With a take-off rating of 2,300 b.h.p. per engine it will be necessary to use four-bladed air-screws of 15ft. 4in. diam.; the reduced diameter will lower the thrust line by 4in. for the same water-clearance as in the original boat. In addition, let us assume that the elliptical nacelle of the original engine (70in. × 61in. approx.) be replaced by a circular one having a diameter of 58in.

The nett wing area, or available lifting wing area is based on two assumptions: (a) width of engines; it is here assumed that the lift over the engines is halved; (b) the completely blanketed wing area for A is assessed and found to be 66 sq. ft., a complete blanketing effect over $2\frac{5}{8} \times 2 = 5\frac{1}{4}$ft of the wing giving this figure. Over the rest of the engine the lift is estimated to be halved; in the case of F, the lift over the engines is again estimated to be halved. The following figures result:—

| | |
|---|---|
| Gross weight A, R.18 | 50,000 lb. |
| ,, ,, F, L.24 | 50,750 lb. |
| Gross wing area | 1,050 sq. ft. |
| Nett wing area without engines | 1,000 sq. ft. |
| Height of R.18 nacelle above aerofoil | 12 in. |
| Height of L.24 nacelle above aerofoil | 0 in. |

## THE LIQUID-COOLED ENGINE (Continued)

| | |
|---|---|
| Completely blanketed wing area of R.18 | 66 sq. ft. |
| Completely blanketed wing area of L.24 | 0 sq. ft. |
| Nett wing loading— | |
| R.18 assumption (a) | 53.2 lb/sq. ft. |
| L.24 " " | 52.9 lb/sq. ft. |
| R.18 " (b) | 55.1 lb/sq. ft. |
| L.24 " " | 52.9 lb/sq. ft. |

Actually the lift over the W-24 cyl. liquid-cooled nacelle is probably greater than in any other high-power engine due to the fact that there is only one vertical bank of cylinders. The fairings over the outer banks meet the aerofoil at or very near the stagnation point. With liquid-cooled installation, the economical speed will be at least 12 m.p.h. faster, giving the former a slight increase in range and/or payload. If the net wing-loading of the liquid-cooled boat be increased by 1 lb/sq.ft., the payload will be substantially increased. Engine nacelle length will be the same in each case.

Adaptability and versatility are among the merits of the W-24 cyl. engine, due to the fact that all cylinders are above the crankshaft horizontal centre line. One has only to think of the amazing Napier "Lion" W-12 with its long list of records on land, sea and in the air—the outer circuit record at Brooklands motor-racing track, the rev record, the land speed record, the low fuel consumption record on a long flight, etc., etc.

Seldom, if ever, is it possible to double power output by doubling the number of cylinders; in a big engine the loss may run into hundreds of h.p. due to the lower breathing efficiency and other reasons. Figures for the newest single-row Wright "Cyclone" recently released are interesting in this respect:—

| | |
|---|---|
| Take-off power | 1,300 b.h.p. |
| High altitude power | 1,100 b.h.p. at 15,300ft. |
| Piston area power | 4.902 b.h.p. (take-off) |
| Power per cylinder | 144.4 b.h.p. .. |

Multiplying by 14 and 18, we get 2,022 and 2,600 b.h.p. —outputs far higher than hitherto recorded even when allowances are made for a slightly shorter stroke in one instance. This state of affairs is marked in most radial engines. In the case of liquid-cooled engines there is no data released, the 12-cyl. engine having held sway for a quarter of a century.

The position, as it now stands, reveals that there is only one really high performance 18-cyl. engine in being in the whole world, the Pratt & Whitney "Double Wasp"; there is no record of any other such engine being used in an aeroplane capable of seven miles a minute. If it were possible to design an air-cooled radial engine that could out-perform any of the tremendous trio, D, E or F, it would be well worth having, but there doesn't seem to be the remotest chance of this happening. Inter-cylinder distance is the great obstacle in the path of the very high duty in-line engine in the 2,000 to 3,000 b.h.p. categories with air-cooling. It makes the X and H unattractive by comparison with their liquid-cooled counterparts. On the other hand, the multi-bank radials having 20, 24 and 28 cylinders, are more attractive with air-cooling.

### Heat Energy Recovery

One more point before summing up: Mr. Lee's statement that the air-cooled engine is more efficient from the standpoint of heat energy recovery does not apply to the most advanced liquid-cooled installations where the air is super-heated after leaving the cooling element.

To conclude: the liquid-cooled in-line engines having 24 or more cylinders are definitely in the ascendant for ultra high-performance military aircraft by virtue of their higher power and greater adaptability. The air-cooled two-row radial will have to give way to the multi-bank radial in the future, if air-cooling is to compete effectively with liquid-cooling. Perhaps Mr. Fedden, that eminent and gifted exponent of the radial, has got something up his sleeve!

# AND NOW THE TYPHOON

### *Formidable Fighter for the R.A.F.*

THERE are not many instances in the history of British aviation of one aircraft firm producing three single-seater fighter types in a period short enough to have all three in service at one time. Yet that is the distinction of the Hawker company, whose Hurricane has done and is doing such excellent work, whose Tornado was mentioned officially some time ago, and whose Typhoon was officially mentioned for the first time over the week-end. The announcement came like a bolt from the blue, even Lord Beaverbrook not having included it in his survey given only a few days earlier.

With a much more powerful armament than that of previous fighters, and a heavier armour, the Typhoon has a greater range and its speed is in excess of 400 m.p.h. The Napier Sabre engine was, as our readers will be aware, designed by Major Frank Halford. It is of the liquid-cooled type 24-cyl. H formation in four banks of six. The Tornado is fitted with a Rolls-Royce Vulture, and it may be assumed that there will be keen rivalry between the two fighter types. Both are formidable weapons, and in addition to speed and armament they have a very high ceiling and a remarkable rate of climb.

No pictures of the Typhoon may be published for the present, but it is to be assumed that Mr. Sydney Camm and his staff will not have departed very far from the "lines" which have been so successful in the Hurricane. The very fact that the Typhoon and Tornado have much more powerful engines (more than 2,000 h.p.) and carry heavier armament will almost certainly be found to mean that they are somewhat larger than the Hurricane, unless the wing loading has been increased.

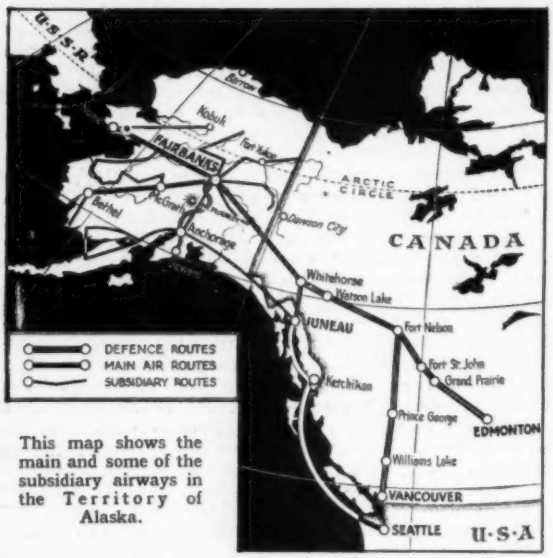
## *Death of C. F. Snowden Gamble*

WITH much regret we have to record the death on April 20 of Sqn. Ldr C. F Snowden Gamble, R.A.F.V.R. As publicity manager of Imperial Airways *Flight* had had many pleasant relations with him, and always found him helpful and courteous. Born in 1895, he was educated at Manchester Grammar School and Manchester University, and was trained as an engineer. In 1916 he became a Sub-Lieutenant in the Royal Naval Armoured Car Division, and afterwards served with the Royal Marines and the R.N.A.S. He has recorded some of his experiences in an excellent book, "The Story of a North Sea Air Station." Another extremely careful and valuable book from his pen was "The Air Weapon." He was among the first to join the R.A.F. Volunteer Reserve, and was called up in August, 1939. Recently he had been Acting Staff Officer for Personnel in the North of England. He died in his sleep.

## *Canadian Aviation News*

ONE year from date of announcement of British Empire Air Training Plan, which was December 17, 1939, there were 34,000 officers and men in the Royal Canadian Air Force. Of these, 2,485 were officers and 31,500 airmen. Of the airmen, 8,450 are training for pilots, air observers and air gunners, with 2,676 pilots actually in training at the anniversary date, 2,050 on guard duty and 1,828 stationed at the manning depôts. Air observers in training number 764 and there are 1,132 air gunners taking courses. Eighty of the 116 units of the plan are under way, eight of 16 service training schools are turning out pilots, and 16 elementary training schools are in operation, compared with 8 originally scheduled.

# THE TERRITORY OF ALASKA




This map shows the main and some of the subsidiary airways in the Territory of Alaska.

## *Wings on Wheels, Skis and Floats : Defence by Air of U.S. and Canada*

ALASKA—a snow-covered country of gambling hells, huskies and ptarmigans, away up at the far end of Canada. So thinks many a Londoner. But whether you wear the ptarmigans to prevent frostbite or use them for pulling your sledge, he has not the faintest idea. Nor is he sure who owns Alaska and is not aware that the United States bought it from Russia in 1867 for a few million pounds. For the territory of Alaska, after its gold rush days, disappeared from the headlines, and so far has not been involved in any happenings sufficiently sensational to put it back there.

The great value of Alaska lies in its mineral wealth and its fur and fishing industries. It has an area of 586,000 square miles which is something over ten times the area of England, but its population is only 60,000, half of which is white. The capital is Juneau, a town of 4,000 people in the southern part but Fairbanks, right in the heart of the Territory, is regarded as the capital of the "interior." Alaska is not well provided with roads or railways and in the old days the dog team and sledge was the most extensively used means of transport. Now air transport is well established because of the great speed which it has when compared to the slow ground travel. In parts a very mountainous country, Alaska's highest peak, Mt. McKinley, rises to 20,000ft.

Considerably more thought is being given to Alaska by both Canada and the United States, largely because of the necessity to arrange for its defence. Its need for air transport too, has brought it to the attention of the Civil Aeronautics Board and one of the Board's economic examiners recently made a complete survey of all the airlines in the Territory, recommending the award of certificates of convenience and necessity to 23 air carriers and the denial of 13 applications. This total of 36 companies in a country with such a small population indicates how widespread air travel is here. But it also indicates that each company is very small—there are only 93 aircraft owned by all 36 of them, less than an average of three each—and consequently there is much more of competition than co-operation With air transport organised in such a manner, it will not achieve its best results, for small companies cannot afford the ground organisation which is essential for efficient working. There has been, however, a certain amount of co-ordination of radio organisation among the small airline companies, several of which own and operate their own communication stations.

The radio situation in Alaska has now been improved considerably. During 1940 six new combined radio range and communication stations and two point-to-point communication stations were completed along an airway extending from Ketchikan to Nome, by way of Juneau, Anchorage and Fairbanks. The 1941 programme provides for at least four other such stations, and some intermediate landing fields near Bethel, McGrath and elsewhere.

Mirow Air Service, operating from Nome, has a fleet of seven aircraft, all of which are radio-equipped. There are two Stinson 10-place Trimotors, and one each Lockheed Vega, Sikorsky S39B, Fairchild 24, Travelair S6000B and Stinson SR7B. The routes run from Nome to Gamble, Anchorage, Fairbanks, Unalakleet, Haycock, St. Michael, Shishmaref and Kotzbue It is strange to find an airline with a woman president, but such is the case, for Mrs. Mirow, the widow of a pioneer airman who was killed while attempting to take supplies to a marooned party, is the head. Mrs. Mirow is not worried by her task, despite its many difficulties, for she was reared in Nome and knows Alaska and its problems. She holds a radio operator's licence and runs her own ground station.

### Climatic Troubles

Though Alaska has a total of 129 landing fields, standing third on the numerical list for all the United States, with California, 174, first, flying is not always an easy matter. During August, with its 24-hour summer day, conditions are almost ideal and wheels and floats are the usual equipment. But temperatures are low in winter and wheels or skis are necessary as landing gear for the snow and ice. Temperatures are so low, in fact, that at the Pacific Alaska Airways hangar at Fairbanks, a "de-freezing" room has been built so that the aeroplane may be brought slowly up to hangar temperature after coming in from a flight in air very much below freezing. It is at Fairbanks, too, that the U.S. Army Air Corps has practically completed a cold weather testing station for its aircraft.

The change of the seasons is a difficult time, for in spring and autumn some of the fields freeze up or lose their snow before others and it is almost necessary to have both types of undercarriage. But one operator, Hakon Christensen, gets over his troubles by using skis for landing on what, in winter, was a snow aerodrome but in the spring has become a mud flat.

But despite all the difficulties of flying in a land where conditions vary so much, civil aviation has gone ahead wonderfully. The earliest statistics available show that for the two years ending March, 1929, only 273,000 passenger-miles were flown, whereas for the year ending June, 1940, the passenger mileage is 5,745,000 with an aircraft mileage of 3,598,000. Passengers carried for the same period totalled 31,435, and 4,315,000 lb. of freight and 520,000 lb. of mail were also carried.

In order to get some idea of what these figures mean it is necessary to compare them with corresponding figures for other countries. In Australia the passenger-mileage for the same year was 49,000,000, over eight times as great, but the population of Australia (7 million) is over one hundred times as great So it is evident that each person in Alaska uses air transport much more than each person in Australia, the average mileage per person per year being 95 for Alaska and 7 for Australia.

Air transport is very important to all Alaskan life, particularly so in winter, for if the services fail there are hundreds of prospectors, miners and trappers scattered in tiny communities on the Alaskan tundra north of Nome

# THE TERRITORY OF ALASKA (Continued)

who would receive no mail during the long Arctic night. And mining in the isolated regions depends on air transport for carrying its cargoes of gold dust and nuggets from the mine to the outside world and food and other freight from the outside in. Even the Eskimos have an interest in the air services, and early each spring the aircraft call at the little Eskimo villages for the cargoes of fox and other furs. These calls for the furs can be made before the break-up on the Bering Sea which allows the boats to get along the coast to the villages in the summer. The pilots have their difficulties to contend with in flying to districts such as these, for the landing grounds are seldom more than cleared areas on the tundra or flat parts on the beaches or sand bars. Few weather reports are available for their guidance, and the air from the Bering Sea and Siberia can brings fogs thick as curtains. In the Far North the compass can behave strangely for the variation at Barrow is about 45 deg.

### From U.S.A. to Alaska

An important line now joins U.S.A. and Alaska. Pacific Alaska Airways, a wholly owned subsidiary of Pan American Airways, was awarded last June by the Civil Aeronautics Board a certificate of convenience and necessity allowing it to operate a service of flying boats, the terminal points being Seattle and Juneau, with a call at Ketchikan. This place is remarkable for its 27-foot tides, and it has been necessary to install a floating dock to solve the problem. The service has since run twice weekly, but of course was suspended in winter between October and May because of floating ice. Due to international problems only partially solved, the Pacific Alaska Clipper, a Sikorsky S42B, must skirt the coast and remain outside the three-mile limit all the way. The distances are: Seattle to Ketchikan, 745 miles; Ketchikan to Juneau, 225 miles.

From Junea, Pacific Alaska Airways run a landplane service with Lockheed Electras through Whitehorse and on to Fairbanks. Branches then run from this town to Bethel in the south-west and to Nome on the west coast.

Northwest Airlines, another American company, is also seeking permission to run a service from U.S.A. to Alaska This line would start at Minneapolis and travel via Fargo, Regina, Edmonton, Grande Prairie and Whitehorse to Fairbanks. Twice weekly with Douglas DC-3s is the intended schedule of the company.

### Defence

From the defence aspect Alaska has become increasingly important, and it has been realised just how necessary is a fast route to the Territory. In March tractor trains moved into the Canadian Northwest with 800 tons of equipment and material to be used in constructing a new series of air bases stretching up from Edmonton and Vancouver. Mr. C. G. Power, Canadian Air Minister, announced some time ago that the bases would be built as part of the defence programme on the recommendation of the Joint Canadian-American Defence Board. These bases will be fully equipped modern aerodromes on two routes, the easterly running from Edmonton.

The route on the western side of the Rockies runs north from Vancouver and Kamloops to Williams Lake, Prince George, and then joins the eastern chain at Fort Nelson, Watson Lake and Whitehorse. An aerodrome is also being built at Smithers, near Prince Rupert, within operating range of Prince George and coastal points. Should the Pacific coast of the American continent become a theatre of war, Canadian and United States fighter squadrons could be moved rapidly to Alaska by air by means of these new aerodromes. Landing strips 4,000 feet long by 500 feet wide, with full lighting equipment for night flying and a complete radio system will be provided.

Existing fields are being developed to conform to regular airport standards, and new fields are being laid out at Watson Lake in the Yukon and Smithers in British Columbia. Fields at Grande Prairie, Fort St. John, Fort Nelson and Prince George, B.C., will be enlarged and improved. Most difficult to build are the fields at Fort Nelson and Watson Lake because of transportation difficulties.

The great importance of Alaska lies in the fact that it is through here that a footing could be gained on the North American continent from Asia. The U.S. Army Air Corps seems alive to this fact and has a base at Anchorage.

A Canadian Rapide seaplane moored at Whitehorse as the paddle steamer "Casca" passes on her way to Dawson City.

# LORD BEAVERBROOK TELLS HIS PEERS

## *Aircraft Position Outlined to the House of Lords : "Secrets" from the American Press*

"WHERE do I get my information?—Out of the American newspapers!" Thus Lord Beaverbrook, Minister of Aircraft Production, when he quoted dimensional and performance figures for Britain's newest bombers during a speech in the House of Lords, given in reply to queries raised by Lord Sempill on American aircraft deliveries.

"We have launched three bombers, the Stirling, the Halifax and the Manchester," he said. "These aircraft I can describe to you." And then, with the above-quoted comment as to his source of information, Lord Beaverbrook continued, "——the Stirling has a wing-span of 127½ft., a range of 3,000 miles and a speed of 330 m.p.h. It has four engines, is faster than the Flying Fortress, the American aircraft, and faster than the Consolidated B-24, sometimes called the Liberator. The Manchester has a span of 90ft., a maximum speed of 325 m.p.h., and two engines. The American newspapers do not tell us what these engines are, but I will tell you; they are Vultures. The American newspapers do not give us any particulars of the Halifax. They make up for that neglect, however, by telling us about the Tornado, a single-seater fighter with a speed of 425 m.p.h. and one engine of 2,000 h.p."

(It is fairly obvious, of course, that the Minister of Aircraft Production was speaking with his tongue in his cheek in apparently giving away this "secret" information.)

### Reassuring Reply

The rest of Lord Beaverbrook's speech, however, was a reassuring reply to any who had entertained doubts on the actual progress made towards air parity with the enemy, and in reply to Lord Sempill's request for information as to certain troubles experienced over here with American radial air-cooled engines, the Minister said that these little difficulties had been overcome.

"The American radial air-cooled engines," Lord Sempill had said, "have a tremendous background of experience behind them, in commercial aviation in particular. It is not at all surprising that some troubles have been struck with military usage as we understand it over here, when engines are called upon to operate at a greater power of output than they would normally do in commercial usage. The troubles are not serious and do not affect the basic soundness of the design, but they must be dealt with practically and far more rapidly than has been the case."

Replying to this point in the course of his speech, Lord Beaverbrook assured the House that the difficulties with the air-cooled engine had been overcome. "We now find that the American engines are quite as good as any other engines in the world and are most useful and most valuable," he said.

An output last month, equal to two and a half times that of March, 1940, and a reserve of machines in excess of 100 per cent. were two of the most striking and encouraging facts about British aircraft production which he disclosed to a gratified House.

The month, said the Minister of Aircraft Production, created a new production record, eclipsing even the February figure, which had also been a record. A 100 per cent. reserve of five operational types of aircraft were in storage all over the country, and if one also included another light type of bomber, the reserve figure was more than 100 per cent.

It was not intended to be satisfied with this reserve, however, and the objective of the M.A.P. was a reserve of as much as 300 per cent. of the latest types of warplanes.

Immense American and Canadian deliveries of aircraft, aircraft parts and of engines had already been received, and a very large number were now in use, nearly 1,000 having been handed over to the R.A.F. These included Canadian-built Hurricanes which Lord Beaverbrook described as "fine machines, ready to fly and fight."

Intimating that convoy losses, though to be deplored, were being more than offset by the rapidity with which the flow from America was increasing, Lord Beaverbrook said that during the past few days 95 aircraft, 355 tons of aircraft parts, and 326 engines had been received by sea.

### Fighters Will Fly Atlantic

The air-ferry system over the Atlantic was to be continued, he added, and, very soon, fighters as well as bombers would be flown over. Only one aircraft had been lost on the ferry service which had been operated throughout the winter, and one machine had made the flight from a Canadian airfield to an R.A.F. station in England in less than nine hours. He "had a thrill" when he stood on an aerodrome with the American Ambassador and watched the first Liberator arrive. This and other types of American aircraft were doing valuable service, he said, and there was no case of serious delay in deliveries from America. In fact, not only were most of the American firms well up to time but some were even ahead of it with their deliveries. He admitted, however, that there had been, and still was, delay in getting equipment—guns, radio apparatus, navigational devices, and so on—but this could be cured by more drive and energy. Repair, maintenance and salvage, however, had "added considerably to our air strength."

Referring to the close co-operation between British and American air experts, Lord Beaverbrook said that operational types of British aircraft were being sent out to America and the transatlantic telephone was in daily use by the technicians. He took great pride in our technicians, who were the finest in the world, and who could be trusted to "make the plans and arrange the projects for the future which will give us the improvement in aircraft design that we require."

### Five New Engines

Five new types of engine had been brought into use, including the Napier Sabre and the Rolls-Royce Vulture, and other new engines were now being worked upon which would be "quite surprising" in the power they developed from limited size and low weight.

"These new products," said Lord Beaverbrook, "are all the work of my predecessors with the exception of the Sabre. The Sabre was put into production in my time, and it was put into production without waiting for any tests, without being quite sure how it would turn out and what the results would be. But, fortunately, I am in a position to tell you that the Sabre is a great engine, perhaps one of the greatest engines that has been produced."

[Lord Beaverbrook's modesty is becoming, but we are under the impression that development work on the Sabre was going on several years before he went to Millbank.—ED.]

Among other things, the Minister mentioned the dispersal system applied to aircraft factories which had been a great success in defeating enemy action, and he stressed that our own production must always be of first importance. He also mentioned that the Anson, Battle and Botha had recently been withdrawn from operational duty and transferred to the Training Command.

# Service Aviation

## Royal Air Force and Fleet Air Arm News and Announcements

### R.A.F.'s Gardening Expert

THE Air Council have appointed Mr. A. H. Whyte as Air Ministry Gardening Officer. He will be attached to the Air Ministry directorate responsible for catering and food supplies, and will be able to work in close liaison with the recently appointed catering inspectors and station welfare officers of the R.A.F. His expert knowledge will be available to units throughout the country, in solving their own particular problems of vegetable production. Soil productivity, local needs and resources, and dietary questions will be dealt with on an expert and scientific basis.

Mr. Whyte will also co-ordinate the gardening activities of the R.A.F. with the Ministry of Agriculture and Fisheries, the County War Agricultural Executive Committees, and with the A.Q.M.G. (Agriculture), his "opposite number" at the War Office. He will also investigate the need for financial assistance for the purchase of implements, seeds and fertilisers, where necessary arranging advances of cash to be repaid from the sale of produce.

### Awards

THE King has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy. The number after each name indicates the squadron with which the recipient is serving:—

DISTINGUISHED SERVICE ORDER.

Wing Commander John Nicholas Haworth WHITWORTH, D.F.C., No. 78.

Squadron Leader James Brian TAIT, D.F.C., No. 51.

Act. Wing Cdr. S. C. ELWORTHY, D.F.C., A.F.C., No. 82.—In March, 1941, this officer was detailed to carry out an attack on enemy shipping off Le Havre. Sighting two enemy tankers of approximately 3,000 tons, escorted by flak ships, he proceeded to attack one of the tankers from a low altitude and, in spite of heavy and accurate anti-aircraft fire from the flak ships scored a direct hit which set the tanker on fire.

On another occasion whilst returning from a successful attack against an enemy dump near Flushing aerodrome he was attacked by two Messerschmitt 109's, but though his rear gunner was wounded, he managed by skilful flying to throw off the enemy fighters and return safely to base. By his magnificent leadership and complete disregard of danger, Wing Cdr. Elworthy has brought his squadron to the highest pitch of war efficiency.

Act. Sqn. Ldr. J. CUNNINGHAM, D.F.C., A.A.F., No. 604.—This officer has continued to display the highest devotion to duty in night fighting operations. On a night in April, 1941, he destroyed two enemy bombers during a single patrol, and later in the same month he destroyed three enemy raiders during three different patrols. Sqn. Ldr. Cunningham has now destroyed at least ten enemy aircraft and damaged a number of others. His courage and skill are an inspiration to all.

DISTINGUISHED FLYING CROSS.

Wing Commander Geoffrey T. JARMAN, No. 77.

Flight Lieutenant Cosme Lockwood GOMM, R.A.F.O., No. 77.

Act. Flight Lieutenant Reginald E. BAILEY, No. 77.

Act. Flight Lieutenant Derek Edmund DAVIES, A.F.C., R.A.F.V.R., No. 149.

Flying Officer David Jackson PENMAN, No. 44.

Flying Officer Charles A. POWNALL, No. 75 (N.Z.).

Flying Officer Tan Adam STEWART, R.A.F.V.R., No. 61.

Flying Officer Frank G. WOODWARD, R.A.F.O., No. 50.

Pilot Officer Robert Clifford ALABASTER, R.A.F.V.R., No. 51.

Pilot Officer Harry Trevor GILBERT, No. 61.

Pilot Officer Kenneth John LAWSON, R.A.F.V.R., No. 149.

Pilot Officer Dennis MURRAY (deceased)—with effect from October 28, 1940.

Pilot Officer Michael John Dunn O'LEARY, R.A.F.V.R., No. 144.

Pilot Officer Donald PEVELER, No 51.

Pilot Officer John Alain Stobart RUSSELL, R.A.F.V.R., No. 10.

Pilot Officer William Jervase UPRICHARD, No. 51.

Flt. Lt. S. J. MONROE, No. 82.—In April, 1941, this officer was detailed to carry out an attack on enemy shipping off the Frisian Islands. In spite of bad visibility he succeeded in locating a 3,000 tons ship escorted by flak ships. In spite of accurate fire from the flak ships, he scored direct hits from a low level and the ship was last seen down by the stern.

During this attack a shell burst in the cockpit, killing the observer and wounding Flt. Lt. Monroe in the ankle. In spite of this wound, he brought his aircraft safely back to base. This officer has displayed great gallantry and devotion to duty and has at all times shown determination in pressing home his attacks.

Flt. Lt. G. D. L. HAYSOM, No. 79.—This officer has been engaged on operational flying since the war began. He has displayed great keenness in his efforts to seek and engage the enemy, and has destroyed at least five of their aircraft.

P/O. A. N. W. JOHNSTONE, No. 47.—This officer has been continuously engaged on operations over a long period, during which he has completed many sorties. On one occasion he observed an enemy bomber on the ground. Unable to destroy it by machine gun fire, he flew past the aircraft, very low, and succeeded in hitting it with a Verey signal cartridge, which set the aircraft on fire. In February, 1941, he made a reconnaissance in Eritrea over the Agordat area, returning with valuable information which enabled land forces to enter the town the following morning. This officer has at all times displayed great enthusiasm, determination and initiative.

P/O. G. A. DENBY, R.A.F.V.R., No. 600.—One night in February, 1941, whilst on patrol this officer sighted a Heinkel 111 flying across his bows, and by determined and accurate attacks he shot it down. Previously, he has attacked and probably destroyed two other hostile aircraft at night. P/O. Denby has taken part in numerous operational night flights, often in bad weather, and his zeal and initiative in these duties have been an inspiration to all.

P/O. I. R. STEPHENS, R.A.F.V.R., No. 38.—One night in March, 1941, this officer was detailed to attack a large concentration of enemy aircraft on the aerodrome of El Machina. Owing to ground mist, the location of the aerodrome was very difficult to find, and, after searching for two hours, P/O. Stephens had to descend to 500 feet before identifying the target. He pressed home his attacks from a height of 1,000 feet in spite of heavy anti-aircraft and machine-gun fire, and destroyed five enemy aircraft and damaged others. This officer displayed great courage and set a magnificent example of leadership and devotion to duty.

DISTINGUISHED FLYING MEDAL.

Sergeant Dennis Chadwick BARNETT, No. 75 (N.Z.).
Sergeant George Frederick DOVE, No 10.
Sergeant Leslie Cosmo EDWARDS, No. 21.
Sergeant Anthony Futcher ELCOATE, No. 10
Sergeant Arthur Henry EVANS, No. 83.
Sergeant Frank James GARDINER, No. 49.
Sergeant Norman GRAY, R.A.F.V.R., No. 50.
Sergeant Kenneth GREENE, R.A.F.V.R., No. 51.
Sergeant Gilbert HAWORTH, No. 50.
Sergeant Ronald Yarwood HIGGINSON, No. 50.
Sergeant Thomas HIGHTON, No. 83.
Sergeant Gerard KELLY, No. 50.
Sergeant Wallace Ivor LASHBROOK, No. 51.
Sergeant Michael Sutton MAAS, No. 10.
Sergeant William MILNE, R.A.F.V.R., No. 49.
Sergeant Alfred Ellis PRIOR, R.A.F.V.R., No. 51.
Sergeant George TARGETT, R.A.F.V.R., No 83.
Sergeant Norman TAYLOR, R.A.F.V.R., No. 77

**UNLUCKY FOR SOMEONE: Members of a Defiant squadron congratulating themselves on their thirteenth victory. The night flying exhaust stubs are of interest.**

Sgt. L. H. C. GAYFER, No. 82.—In April, 1941, Sgt. Gayfer was the air gunner of an aircraft engaged in daylight operations in the vicinity of Flushing. Whilst returning from the target area at a height of 2,000 feet, the aircraft was intercepted and attacked by a Messerschmitt 109.

The enemy fighter made repeated attacks during which Sgt. Gayfer was wounded, and his aircraft hit several times. In spite of his wounds and damage to his gun turret, he continued to use his gun with such determination and accuracy that the enemy was forced to break off the engagement. This airman, during his 34 operational sorties, has continuously displayed great courage and devotion to duty.

Sgt. R. L. SMITH, R.A.F.V.R., No. 82.—In March, 1941, Sgt. Smith was detailed to search and attack enemy shipping off Le Havre. Having sighted two large tankers he carried out a determined attack from 200 feet, in spite of intense anti-aircraft fire from the escorting flak ships. He succeeded in scoring two direct hits on one of the tankers which set it on fire. Although his starboard engine was badly damaged he successfully brought his aircraft back to base.

Sgt. Smith has carried out 37 operational sorties and has displayed great courage and determination under all conditions.

Sgt. J. MANN, No. 91.—This airman has displayed great keeness in his many operations against the enemy, and has destroyed at least four of their aircraft. His enthusiasm and fighting spirit have been outstanding, and this was particularly displayed on one occasion when, during a patrol, his aircraft was severely damaged through enemy action. With great presence of mind, and despite his aircraft being uncontrollable at the time, he warned his Flight Commander by radio telephone of the danger from a rear attack by enemy aircraft and almost certainly saved the Commander from being shot down.

### Roll of Honour

*Air Ministry Casualty Communiqué No. 66.*

THE Air Ministry regrets to announce the following casualties on various dates. The next-of-kin have been informed.

KILLED IN ACTION (WHILE FLYING IN OPERATIONS AGAINST THE ENEMY).—P/O. E. R. Arnold, 77903; Sgt. H. Beddall, 565055; Sgt. R. Brames, 755275; Sgt. S. Broadhurst, 550817; Sgt. D. N. Buckley, 633416; Sgt. F. R. A. Chalk, 534048; Sgt. E. J. Chinn, 939762; Sgt. W. R. Clinton,

# SERVICE AVIATION (Continued)

968041; Sgt. F. J. Cockram, 903440; Act. F/O. A. E. Cooper, 77963; P/O. G. H. Cowings, 87384; F/O. E. G. Cubitt, 72480; P/O. C. T. Davis, D.F.C., 33563; Sgt. H. Dunbar, 570770; P/O. M. R. C. Dyer, 84992; F/O. C. H. Elliot, 41159; Sgt. R. L. A. Ellis, 742693; Sgt. G. S. Gates, 751899; Sgt. D. Gilmore, 818024; Sgt. J. Killen, 751525; Sgt. L. J. Kirk, 755374; Sgt. E. A. Lee, 759278; Sgt. R. Lucas, 741992; Sgt. C. J. Lyon, 974218; Sgt. R. MacKinnon, 527591; Sgt. P. M. A. MacSherry, 939052; P/O. F. G. Malim, 83279; Sqn. Ldr. R. J. C. Nedwill, 31469; Sgt. H. H. Newbury, 624214; A/C.1 R. H. Oldfield, 940612; P/O. R. C. Parkhurst, 45232; Sgt. E. K. Robinson, 751776; P/O. L. D. Sandes, 42892; P/O. H. L. Seward, 84530; Sgt. G. H. Slack, 754693; F/O. A. W. Smith, 41075; P/O. J. S. Southwell, 41959; F/O. A. E. Whitworth, 33555.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—L./AC. J. A. Bolton, 538775; P/O. R. A. De Mancha, 80546; Sgt. D. D. English, 742163; Sgt. G. R. Fryer, 759334; Sgt. R. B. Guest, 905255; P/O. E. E. Howarth, 42129; P/O. P. A. G. Learmond, 33490; Sgt. A. B. Lindsay, 751189; P/O. C. P. Lupton, 36372; Sgt. H. O'Donnell, 740193; Sgt. J. H. Potter, 747830.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. G. C. Ankers, 581136; Sgt. F. J. Atkins, 903401; Sgt. B. Baker, 935961; Sgt. J. Bann, 581165; Sgt. F. J. R. Beavis, 563045; A/C.1 J. B. Belderson, 570289; Sgt. K. Bell, 565626; Sgt. S. L. S. Belton, D.F.M., 581261; Sgt. A. Berry, 968035; F/O. E. R. Berry, 39959; Sgt. A. E. Boland, 651257; Sgt. J. J. Brimble, 741565; Act. Flt. Lt. D. C. Bruce, 39853; Sgt. H. Chambers, 632993; A/C.1 P. Clark, 623619; F/O. P. Collard, D.F.C., 90402; Sgt. G. R. Collett, 745500; P/O. R. M. Coulman, 41557; Sgt. W. R. Cowell, 628277; P/O. T. J. Cranidge, 42947; Flt. Lt. J. L. G. Cunningham, 90194; F/O. R. G. Cuthbert, 41260; F/O. P. J. Danielsen, 90248; Sgt. G. Davies, 552076; P/O. M. B. Dawson, 42205; Sgt. K. H. Dobb, 745629; F/O. I. H. Dolman, 41264; Sgt. R. Donaldson, 542626; F/O. J. S. Douglas Cooper, 37964; Sgt. E. Duffield, 546967; Sgt. T. S. Duncan, 521723; Sgt. H. Dunnington, 612371; Sgt. J. H. M. Ellis, 742068; Sgt. C. D. Evans, 617444; P/O. W. E. Fitzpatrick, 79540; Sgt. G. B. Fleming, 581173; Sqn. Ldr. J. B. Fyfe, D.F.C., 24208; Sgt. B. P. Gannon, 741151; Sgt. A. Gibson, 751217; Sgt. W. Goodwill, 620440; P/O. A. Gordon-Peiniger, 40904; Sgt. M. Gott, 522865; Sgt. A. J. Griffiths, 581384; Sgt. F. V. Gunning, 580613; P/O. E. R. Hale, 42219; L./AC. R. H. F. Hammond, 536608; Sgt. P. R. Harris, 581152; P/O. D. M. Harry, 40823; Sgt. J. F. Hatch, 903079; Sgt. F. B. Hawley, 748286; L./AC. J. F. Hindle, 546994; Sgt. E. Hopperton, 625552; Sqn. Ldr. P. A. Hunter, D.S.O., 32081; Sgt. F. Hutton, 519997; Sgt. I. Inskip, 581339; L./AC. M. J. E. Jarvis, 530166; L./AC. L. P. Jepp, 550735; Sgt. W. L. Johnston, 759044; P/O. F. H. Jones, 44074; P/O. J. S. B. Jones, 33467; Sqn. Ldr. N. C. Jones, 33061; P/O. O. H. Keedwell, 41427; P/O. R. Kidson, 41297; P/O. F. H. King, D.F.M., 43845; L./AC. J. H. Lane, 517249; P/O. J. E. P. Laricheliere, 42849; L./AC. A. O'N. McCoy, 903300; Sgt. T. W. McDonagh, 581348; P/O. D. R. MacDonald, 74679; Sgt. D. MacKay, 551045; P/O. J. W. McKenzie, 33461; P/O. C. Matheson, 41722; Sgt. W. Maxwell, 967872; Sgt. E. K. Mellody, 969831; Act. Flt. Lt. D. D. Middleton, 39105; Act. Flt. Lt. J. D. Middleton, 33326; Sgt. W. R. Miller, 742485; Sgt. H. F. Montgomery, 741305; Sqn. Ldr. B. S. Monypenny, 29098; Act. Wing Cdr. G. S. Morgan-Weld-Smith, 05224; Sgt. M. Murphy, 624178; Sgt. P. Murphy, 532831; Sgt. W. P. O'Heney, 643564; Sgt. R. G. Oliver, 581525; Sgt. E. A. Pearce, 742651; A/C.1 J. F. Peel, 623315; Sgt. D. H. Peuleve, 614230; Sgt. C. W. Pickering, 742976; Sgt. A. M. Pillans, 751549; Sgt. R. S. Powell, 6:4266; Sgt. T. O. Price, 638145; Sgt. M. Rees, 637154; Sgt. E. A. H. Riley, 580943; Sgt. J. A. Rogers, 900084; P/O. J. Seeds, 33445; F/O. I. G. Shaw, 40265; P/O. R. H. Shaw, 77465; P/O. D. C. Shepley, 33464; F/O. A. S. Smith, 40187; Sgt. K. B. Smith, 754895; P/O. D. E. Stewart, 42683; Sgt. R. C. E. Stiles, 639949; P/O. J. R. Swift, 77213; Sgt. P. W. Swinson, 620418; Sgt. D. Tailford, 526290; Sgt. G. W. Tarlin, 580406; Sgt. P. B. Taylor, 581362; P/O. W. F. Tudhope, 41224; Sgt. R. V. Turner, 937492; Sgt. A. E. Walker, D.F.M., 615619, Act. Flt. Lt. W. H. C. Warner, 90344; Sgt. F. Watson, 580743; P/O. P. G. A. Watson, 74345; Sgt. T. F. Westmoreland, 741143; Sgt. A. A. Wilmot, 751064; P/O. D. L. Wingate, 33470; Sgt. J. F. Wise, 746875; P/O. D. N. Woolger, 42666; Sgt. L. E. Worthington, 745453; F/O. G. F. M. Wright, 90265.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. F. T. Allcock, 939984.

WOUNDED OR INJURED IN ACTION.—P/O. R. V. Ashley, 79744; Sgt. A. Fletcher, 6490011; Sgt. J. Grant, 552534; P/O. J. T. Noble, 42636.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. F. D. Healing, 642554; Sgt. S. E. Sproson, 745815; P/O. The Hon. R. D. Wilson, 79546; Act. Flt. Lt. G. P. Yarrow, 72588.

PREVIOUSLY REPORTED PRISONER OF WAR, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. G. Atkinson, 580557.

MISSING, BELIEVED KILLED IN ACTION.—P/O. A. C. Burton, 89634; F/O. J. M. F. Dewar, 72462; P/O. R. A. L. Duvivier, 79370; P/O. V. D. Emms, 81337; Sgt. D. Gunn, 621074; Sgt. D. Henshaw, 936323; Sgt. J. H. Kelly, 903258; Sgt. J. Mathews, 740784; Sgt. L. F. Steele, 817001; Sgt. J. K. York, 647004.

PREVIOUSLY REPORTED KILLED IN ACTION, NOW REPORTED MISSING.—Sgt. J. S. Gilders, 741587.

MISSING.—Sgt. E. G. Abraham, 747928; Sgt. S. W. Adair, 749453; Sgt. W. Ainsbury, 755576; Sgt. P. Archer, D.F.M., 751903; Sgt. L. A. Arrighi, 749492; P/O. J. Bainbridge, 78988; Flt. Lt. A. L. H. Barber, 33296; Sgt. S. H. Bevan, 959593; Act. Flt. Lt. H. J. W. Black, D.F.C., 42739; Sgt. A. R. Butler, 747838; Sgt. T. H. Cooke, 742792; P/O. D. W. Date, 86661; P/O. J. A. Duff, 86716; Act. Wing Cdr. W. J. B. Elliott, 21119; Sgt. C. R. Evans, 745506; Sgt. F. Gibbs, 755569; Sgt. E. H. Harvey, 970533; Sgt. J. W. T. House, 755460; Sqn. Ldr. F. J. Kelly, 37188, Sgt. V. S. Key, 759103; Sgt. O. H. King, 904527; P/O. N. C. MacIver, 88694; Sgt. A. G. D. MacKay, 745349; Sgt. G. S. M. MacLeod, 553787; P/O. W. W. McMaster, 85679; Sgt. A. L. Millington, 751586; Sgt. J. L. Montague, 976080; P/O. E. P. Moore, 79752; Sgt. N. Morrison, 740636; Sgt. R. F. Murphy, 755142; P/O. A. W. B. Newman, 87427; P/O. J. K. Punshon, 42724; P/O. R. Smith, 87383; Sgt. W. C. Stone, 634726; P/O. R. G. Wales, 87420; Sgt. B. J. O. Watkins, 633030; P/O. W. T. Watkins, D.F.M., 45307; Sgt. S. A. Wilkins, 623678; Sgt. H. Willis, 971577.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE (WHILE ENGAGED ON NON-OPERATIONAL FLYING DUTIES OR ON THE GROUND THROUGH ENEMY ACTION).—Sgt. W. A. Crosswell, 903426; P/O. F. S. H. Ford, 60785; Sgt. H. S. Murray, 976992; Sgt. H. C. Salt, 947364; Sgt. A. J. Turner, 541403; Sgt. G. Whittaker, 1107550; Sgt. W. P. Wilkinson, 917136.

KILLED ON ACTIVE SERVICE.—L.A/C. E. J. M. Atherton, 997624; L.A/C. K. H. Beale, 1254405; Sgt. J. C. Bell, 580239; Sgt. F. J. Berry, 751784; Sgt. V. R. Bidlake, 918825; A/C.1 G. Borg, 776857; Act. Wing Cdr. K. N. Clarke, D.F.C., 29063; A/C.1 J. Cordiner, 552757; P/O. J. R. Cresswell, 89345; Sgt. A. C. Davidson, 966403; Flt. Sgt. H. Dodsworth, 561105; A/C.1 C. T. Douglas, 619059; L.A/C. M. G. Folkard, 999012; Sgt. J. Forster, 1259563; Sgt. C. H. D. Frost, 910014; Sgt. B. C. Gilmore, 976949; A/C.1 T. Gilmore, 972422; Sgt. K. E. Holder, 745890; L.A/C. R. G. Hughes, 1169220; L.A/C. I. W. Jackson, 1153084; Sgt. F. S. Jessop, 950861; Sgt. D. Kirkland, 745364; Sgt. G. G. S. Laws, 745649; Sgt. F. X. Leighton, 552119; P/O. C. Logan, 44178; A/C.1 P. P. Lowe, 939607; Sgt. W. R. Loxton, 965481; Sgt. J. D. McCallum, 967874; P/O. A. N. McKelvie, 60784; F/O. B. G. Mace, 33450; Act. F/O. A. L. Munro, 78856; Act. Sgt. D. F. Murray, 912735; Act. Flt. Lt. E. Ostlere, 72064; L.A/C. J. C. Parker, 1254704; L.A/C. S. Porter, 990449; A/C.1 T. E. B. Price, 942179; P/O. J. E. Richmond, 88014; Flt. Lt. J. F. Ritchie, 39684; Grp. Capt. J. B. H. Rogers; L.A/C. D. J. Rudd, 928935; L.A/C. E. A. Rundell, 927867; Sgt. G. J. A. Sandfield, 917816; L.A/C. A. Mc. K. Stott, 1058784; Sgt. D. A. Taylor, 747821; A/C.2 J. W. Taylor, 1021337; Sgt. F. H. Thomson, 922720; P/O. R. H. Weber, 89372; P/O. M. J. West, 88015; Cpl. J. D. Wheeler, 149389; Sgt. W. Wilson, 748084; Sgt. M. F. Woodhams, 1161131; Sgt. J. S. Wrightson, 936191.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.2 E. J. Toy, 572787; Sgt. E. Waite, 590565; L.A/C. T. Ward, 1152201.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. W. F. Chard, 21476; Cpl. R. Conkie, 534598; A/C.1 T. W. Ross, 617913; A/C.1 D. J. Scoins, 624090; L.A/C. L. Traynor, 268892; Sgt. K. G. Walker, 625837; L.A/C. J. A. Williamson, 530579.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—P/O. D. S. Brooke, 85936.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.1 W. H. Baglin, 860429; P/O. P. F. Black-ford, 33507; P/O. G. D. Edwards, 44778; P/O. W. P. Ferrie, 60570; L.A/C. E. W. Fitzgerald, 841209; A/C.2 J. L. Flower, 915694; P/O. R. M. Graham, 60526; A/C.1 R. M. Haldane, 1005626; A/C.1 F. R. Jasper, 925611; Cpl. D. John, 865638; Sgt. F. P. King, 938111; Sgt. C. F. Redgrave, 755508; Sgt. R. O. Rogers, 979582; Act. F/O. A. T. Sword-Daniels, 77127; L.A/C. P. G. Watts, 1177637.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. D. McL. Barclay, 754425; L.A/C. J. H. Brand, 846936; Sgt. J. H. Case, 968781; Sgt. F. A. L. Hankins, 908785; Cpl. A. MacArthur, 530339; P/O. J. G. MacCoubrey, D.F.M., 45200; Sgt. R. M. Neale, 911409; L.A/C. L. J. Prior, 630635.

DIED ON ACTIVE SERVICE.—Act. F/O. W. G. Airey, 60429; A/C.2 J. Azzopardi, 776933; L.A/C. D. A. Barkham, 542519; A/C.2 R. Blake, 994921; Act. Flt. Lt. L. Brown, 35395; A/C.2 E. Burns, 952815; L.A/C. F. Callaghan, 624558; Sgt. A. O. J. Cocks, 370188; L.A/C. F. Crowther, 533282; Act. Flt. Lt. P. J. Davies, D.F.C., 81458; Sgt. A. Dossett, 354909; A/C.2 D. S. Jones, 1071592; A/C.2 R. N. Lloyd-Hughes, 966459; Act. Wing Cdr. W. F. Quilliam, 21159; A/C.2 S. J. Sharples, 977798; A/C.2 H. S. Shinn, 965992; A/C.1 J. D. Wright, 1066261.

PREVIOUSLY REPORTED MISSING, NOW REPORTED SAFE.—Sgt. L. Bird, 530075; A/C.1 A. J. McIntosh, 776329; P/O. S. H. Miller, 81016.

## W.A.A.F.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.W.2 B. M. Cox, 893371.

## Royal Australian Air Force

MISSING, BELIEVED KILLED ON ACTIVE SERVICE (WHILE ENGAGED ON NON-OPERATIONAL FLYING DUTIES OR ON THE GROUND THROUGH ENEMY ACTION).—P/O. E. W. McLeod, Aus. 404007.

KILLED ON ACTIVE SERVICE.—P/O. P. M. Sloss, Aus. 400158.

## Royal Canadian Air Force

KILLED IN ACTION.—P/O. C. P. Davidson, J.3113.

MISSING.—P/O. I. McLean, J.3115.

## Royal New Zealand Air Force

KILLED IN ACTION.—P/O. R. Daniel.

WOUNDED OR INJURED IN ACTION.—Sgt. L. P. Ryan, N.Z. 40948.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. G. R. Wilson, N.Z.40953.

# London Gazette

## Royal Air Force

*Air Ministry,*
*April 18, 1941.*

### *General Duties Branch*

Flt. Lt. (temp. Sqn. Ldr.) C. F. King is granted a perm. comman. in substve. rank of Flt. Lt. (Oct. 19, 1940).

The follg. are granted comms. for duration of hostilities as P/Os. on probn.:—Sgts.: (Mar. 23) G. A. MacMahon; (Mar. 24) C. O'Brien, R. Wolton, E. F. Hart; (Mar. 29) R. Binks, D.F.M., O. D. Thomas; (Mar. 30) G. Goodman; (Mar. 31) I. P. Bishop.

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Mar. 7) B. R. Champion, J. M. O. Dyer, M. Negus, N. Rowland, R. A. Shuttleworth; (Apr. 1) B. M. Bannister, H. G. Cattell, D.F.C., A. C. Culver, W. G. Easton, R. Godwin, L. S. Holman, R. G. Ivemey, L. B. Noyes, F. Landrey, A.F.M., K. F. Scotney, D.F.M.

Wing Cdr. H. K. Goode, D.S.O., D.F.C., A.F.C. is promoted to rank of Grp. Capt. (temp.) (Mar. 1).

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Dec. 3, 1940) C. T. V. Craxton, D.F.C.; (Jan. 30) C. B. F. Kingcombe, D.F.C.; (Feb. 5, seen May 5, 1940) J. Fleming; (Feb. 20) D. C. Skene; (Feb. 22) P. S. G. Andersen, R. K. F. Bell-Irving, A. L. McDowell; (Feb. 24) A. C. Glenday; (Mar. 23) S. G. Hall, H. C. Kierstead, J. H. Kynoch, R. D. Mar, P. G. H. Matthews, F. H. Savage, J. E. Watts, G. P. Wildish; (Mar. 24) C. J. Callingham, A. W. Mack; (Mar. 27) G. C. Banning-Lover, A.F.C., A. Brown, K. R. Burns, T. N. Sills; (Apr. 7, seen July 7, 1940) P. H. Baldwin; (Apr. 7, seen Jan. 7) A. C. L. Akroyd-Stuart; (Apr. 12) T. H. V. Pheloung, I. J. Spencer.

The follg. P/Os. are promoted to war substve. rank of F/O.:—(Nov. 6, 1940) N. A. Savill, B. A. P. Williams; (Feb. 1) E. R. M. Appleton; (Feb. 4) E. O. Walsh; (Feb. 18) D. McIntosh; (Feb. 24) D. H. F. Horner, S. G. Whiting, R. G. Winnicott; (Mar. 2) G. C. R. Barker, J. E. B. Carey, P. W. M. Carlyon, H. Downey, R. F. Forbes, D. F. Lamb, D.F.C., C. I. Malcolm, W. A. Mostyn-Brown, T. F. O'Byrne; (Mar. 7) A. E. Lee (2nd Lt., R. Tank R.); (Mar. 9) A. S. Malcolm; (Mar. 10) R. C. W. Barnes; (Mar. 24) D. S. Kinder, M. R. MacClancy, W. B. H. Statham, C. R. Dwight; (Apr. 6) L. E. Pearson.

P/O. on probn. H. Hobley is promoted to rank of F/O. on probn. (Dec. 1, 1940).

P/O. F. C. Rivers is transfd. to Technical Branch (Apr. 28, 1940).

P/O. M. F. S. Laughton takes rank and precedence as if his appt. as P/O. bore date Feb. 28. Reduction to take effect from Feb. 21.

Flt. Lt. M. D. Evans relinquishes his short service comms. on account of ill-health (Apr. 10).

### *Technical Branch*

The follg. are granted comms. for duration of hostilities as F/Os. on probn.:—W/Os.: (Mar. 16, seen Oct. 30, 1940) A. Pugh; (Mar. 20, seen Nov. 22, 1940) N. Rowls; (seen Nov. 28, 1940) R. Wright, D.F.M.; (seen Dec. 4, 1940) J. H. Dellbridge; (seen Mar. 7) E. F. Macey; (Mar. 24, seen Nov. 28, 1940) R. L. Hammant; (seen Dec. 20, 1940) W. J. Gale. As P/Os. on probn.:—W/Os.: (Mar. 10) H. W. F. Winter; (Mar. 23) C. V. Colbon; (Mar. 26, seen Nov. 21, 1940) L. B. W. Palmer; (seen Jan. 22) R. T.

# SERVICE AVIATION (Continued)

Brown. Act. W/O.: (Mar. 17) H. F. Jacob. Flt. Sgts.: (Mar. 22, sen. Nov. 26, 1940) A. J. H. Holmes; (Mar. 18, sen. Nov. 28, 1940) S. Marrison. As Act. P/Os. on probn.:—Flt. Sgt.: (Mar. 28) L. Phillips. Sgt.: (sen. Dec. 4, 1940) V. A. Shutt.

The follg. are granted commns. for duration of hostilities as Act. P/Os. on probn. (Feb. 28):—Flt. Sgts.: (sen. Nov. 13, 1940) L. G. Raspison, W. J. Scoles; (sen. Nov. 15, 1940) H. J. Roberts; (sen. Nov. 18, 1940) P. C. Wright; (sen. Nov. 19, 1940) G. Robson; (sen. Nov. 20, 1940) R. F. Nies; (sen. Nov. 21, 1940) E. F. C. Worthy (substd. for notifn. of Mar. 28).

The follg. P/Os. on probn. are promoted to war substve. rank of F/O. on probn.:—(Nov. 11, 1940) A. E. A. MacDonald; (Mar. 1) D. McDermott, H. H. Mansfield, W. H. Cauley, L. G. Blake, A. P. Crowley.

*Administrative and Special Duties Branch.*

The follg. are granted commns. for duration of hostilities as F/Os. on probn.:—W/Os.: (Feb. 13) F. G. Jaffrey; (Mar. 17) A. H. Howse, A. Leedham; (Mar. 24) G. A. Weight. As P/Os. on probn.:—W/Os.: (Feb. 15) F. A. Boyle; (Mar. 9) F. Whatmough. Flt. Sgt.: (Mar. 24) J. O. Gibson. Sgt.: (Mar. 23) R. Renner. Cpl.: (Mar. 25) P. A. Townsend. As Act. P/Os. on probn.:—Sgt.: (Mar. 21) C. W. M. Brock. Cpl.: (Mar. 28) H. J. Scott-Browne.

The follg. P/Os. on probn. are promoted to war substve. rank of F/O. on probn.:—(Feb. 1) H. S. Clark; (Feb. 26) J. R. Robinson; (Mar. 1) F. A. V. Charlesworth; (Apr. 1) J. P. Carlile.

P/O. on probn. M. P. Croft is promoted to war substve. rank of F/O. on probn. (Feb. 1) (substd. for notifn. of Mar. 21).

P/O. on probn. L. R. Batten is transfd. to Technical Branch (Apr. 28, 1940).

*Equipment Branch.*

W/O. A. F. C. Donald is granted a commn. for duration of hostilities as P/O. on probn. (Mar. 28).

Act. P/O. on probn. J. H. Sanderson is graded as P/O. on probn. (Mar. 21).

F/O. G. B. Lewis is promoted to war substve. rank of Flt. Lt. (Jan. 10).

P/O. A. L. Prince is granted war substve. rank of F/O. (June 11, 1940).

*Accountant Branch.*

W/O. J. Makepeace is granted a commn. for duration of hostilities as P/O. on probn. (Mar. 24).

Act. P/O. on probn. T. D. F. Colgan is graded as P/O. on probn. (Mar. 29).

## Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

*General Duties Branch.*

P/O. A. Rowan (Sqn. Ldr., R.A.F. Ret.) is granted the rank of Flt. Lt. (Mar. 3).

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Mar. 23) R. Hawkins, M.C., P. A. Travers, P. R. Vincent; (Mar. 28) Count M. B. Czernin, D.F.C.

*Technical Branch.*

Flt. Lt. M. A. Smith is promoted to rank of Sqn. Ldr. (temp.) (Mar. 1).

## Royal Air Force Volunteer Reserve

*General Duties Branch.*

The follg. are granted commns. for duration of hostilities as P/Os. on probn.:—(Mar. 24) G. W. Hills. Sgts.: (Jan. 15) A. D. Frecker; (Feb. 13, sen. Oct. 30, 1940) J. K. C. Ralston; (Feb. 26) F. C. Hill; (Mar. 14) M. M. Wiseman; (Mar. 18) A. D. Meredith; (Mar. 22) J. K. Maxwell, H. Marsden, A.F.M.; (Mar. 24) R. G. Marland, N. H. D. Ramsay; (Mar. 25) St. J. C. de H. Elstub, M. C. C. Haycraft; (Mar. 27) D. J. Steadman; (Mar. 28) M. E. Hallam; (Mar. 29) S. C. Johnson; (Apr. 1) G. P. Reece. L/AC.: (Dec. 21, 1940, sen. Nov. 24, 1940) D. W. Eadie; (Jan. 12) H. H. Lawson, J. K. Lyon; (Jan. 29) D. P. F. C. Mauchlen; (Mar. 9) D. A. Halsall, J. T. W. Kelly; (Mar. 15) W. G. McDowell, K. H. Mears, G. C. T. Richards; (Mar. 16) W. A. Downes, G. A. Prosser, L. A. D. Speller, J. A. V. Stockley, L. G. Walker; (Mar. 23) E. G. K. Beadman, F. Clements, D. Colby, E. M. Cowperthwaite, B. J. A. S. Denville, G. B. Eccles, N. J. Freeman, G. Graham-Smith, P. E. Holme, F. B. McCulloch, J. H. Menary, J. R. Tracey, R. H. Williamson, P. K. Woodsend, J. N. W. Young; (Mar. 27) D. L. Atkinson, W. G. E. Becker, R. H. W. Beresford-Peirse, D. V. Bingham-Hall, R. S. R. Blennerhassett, C. C. Calder, L. E. Cook, L. V. Craxton, C. H. Danielsen, S. J. B. Hamilton, L. J. Jackson, D. C. James, S. H. Last, M. R. Moorley.

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Feb. 10) F. Brookes; (Mar. 3) J. R. M. Sales; (Mar. 4) J. R. Moore; (Mar. 7) E. A. Benjamin, W. B. Bilten, J. F. Castle, B. R. W. Hallows, N. C. Langham-Hobart, J. E. P. Thompson; (Mar. 10) R. D. J. Archer, R. Brown, I. W. Forsyth, K. J. Foster, E. J. Gibson, E. G. C. Leathem; (Mar. 17) F. J. Holmes, W. Murray; (Mar. 20) J. Stansell; (Mar. 24) R. G. Barrell, M. I. Dore, W. C. Hall, G. S. Hebron, D. Kidger, A. W. Martin, W. A. H. Watson; (Mar. 26) E. S. Barnes, J. K. Rhodes; (Mar. 31) J. Harrop; (Apr. 1) P. W. M. Mallorie, E. J. B. Martin, A. H. Quartermaine.

The follg. P/Os. on probn. are confirmed in their appts. on Dec. 30, 1940, and promoted to war substve. rank of F/O. (Mar. 2):—A. E. Lovett, L. W. J. Watt, D.F.C.

The follg. P/Os. on probn. are confirmed in their appts. on Jan. 13, and promoted to war substve. rank of F/O. (Mar. 2):—F. G. Baker, E. S. Arnold.

P/O. on probn. H. C. F. Barham is confirmed in his appt. Jan. 13, and promoted to war substve. rank of F/O. (Mar. 9).

The follg. P/Os. on probn. are confirmed in their appts. Feb. 3, and promoted to war substve. rank of F/O. (Mar. 16):—W. G. R. Paice, H. E. Winser, W. Wright.

P/O. on probn. G. A. Hoar is confirmed in his appt. Feb. 10 and promoted to war substve. rank of F/O. (Mar. 16).

P/O on probn. S. V. Alderton is confirmed in his appt. Mar. 2 and promoted to war substve. rank of F/O. (Apr. 6).

Act. P/O. on probn. J. H. A. Linton is confirmed in his appt. Feb. 6 and graded as P/O. on probn. (Nov. 3, 1940).

Act. P/O. on probn. J. H. Wilson is confirmed in his appt. Feb. 13 and graded as P/O. on probn. (Nov. 9, 1940).

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Aug. 26, 1940) W. Beckingham, L. J. Cheney, A. H. Collins, E. W. Donati, L. F. Evans, E. S. Hale, L. C. Sutton, T. Wewege-Smith; (Aug. 28, 1940) W. L. Theys; (Sept. 26, 1940) H. Schaverien, C. W. Street; (Oct. 23, 1940) E. J. Newton, J. H. Rankin.

F/O. N. R. Dobree is promoted to war substve. rank of Flt. Lt. (Feb. 6).

The follg. P/Os. are granted war substve. rank of F/O.:—(Feb. 26, 1940) J. D. Gardiner; (July 2, 1940) M. J. B. Stoker.

The follg. relinquish their commns. on account of ill-health:—P/Os. on probn.: (Apr. 11) E. Albon; (Apr. 15) A. H. Curry. Act. P/O. on probn.: (Apr. 15) L. E. Ticehurst.

P/O. P. J. Haaren resigns his commn. (Mar. 24).

The comm. of P/O. on probn. N. McH. Brown is terminated on cessation of duty (Apr. 12).

*Technical Branch.*

The follg. are granted commns. for duration of hostilities as P/O. on probn.:—Sgt.: (Mar. 27, sen. Dec. 2, 1940) B. A. M. Herbert. As Act. P/Os. on probn.:—(Feb. 21) G. F. L. Fischer; (Mar. 7) A. E. R. Basford; (Mar. 21) R. G. Futcher, T. E. C. Graty, F. Hughes, T. V. Prior, L. K. Rivers-Macpherson, H. Ward. Sgt.: (Mar. 28) J. R. Fennessy.

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Mar. 7) P. C. Gardiner; (Mar. 11) F. N. B. Bennett; (Mar. 14) T. A. Pringle; (Mar. 27) W. A. Tarry; (Mar. 29) S. Broadbent; (Mar. 30) E. A. R. Landon.

P/O. J. M. R. Sutton is granted war substve. rank of F/O. (June 11, 1940).

*Balloon Branch.*

The follg. are granted commns. for duration of hostilities as P/Os. on probn.:—Cpls.: (Mar. 14) L. M. Cooper; (Mar. 24) D. W. Sherwen; (Mar. 28) A. C. Annand.

*Administrative and Special Duties Branch.*

The follg. are granted comns. for duration of hostilities as P/Os. on probn.:—(Feb. 14) A. C. Aspinall; (Feb. 24) J. H. Baldwin; (Feb. 28) L. K. James; (Mar. 7) B. S. Arvoy, D.S.M., M. J. I. Kemper, A. G. A. Morrison; (Mar. 14) D. Pease, F. H. V. Robinson; (Mar. 15) W. C. Mackintosh, E. F. Morison; (Mar. 20) A. P. Howe; (Mar. 21) F. D. Andrews, W. L. Antrobus, W. Bennett, R. D. Crump, E. K. Davies, M. H. Disney, J. McG. Drummond, D. A. Gill, G. F. Godfrey, J. H. Harcourt-Williams, H. R. Hall, S. H. Harris, E. G. Haydon, S. H. Hilliker, J. D. Home, A. Hutcheson, M. S. Iveson, B. B. Lemon, J. Millar, K. N. Murray, O. L. Niven, J. Paterson, R. A. E. Pennell, A. Read, A. E. Roach, P. H. Sadler, J. T. Shelbourne, R. A. Somervell, H. G. Taylor, H. Wise, J. D. Witthoft; (Mar. 22) N. A. T. Macleod, S. J. Meggitt, H. N. Stansfield; (Mar. 24) F. L. Cooper; (Mar. 31) R. B. Applewhite, A. Bell, P. V. Binney, C. W. Eaves, E. I. T. Jones, J. Scott, B. Wallis. Flt. Sgt.: (Mar. 17) E. Monks. As Act. P/Os. on probn.:—Sgts.: (Mar. 21) F. C. Alway; (Mar. 22) R. D. Usherwood; (Mar. 28) A. W. Harman, F. A. W. Brockes. Cpls.: (Mar. 28) C. Smith, C. H. Pocock. L/A/C.: (Mar. 28) J. Monckton, J. H. Gill, D. A. Kershaw. A/C.1: (Mar. 28) G. K. Meakin, E. J. S. Easton, G. East. A/C.2: (Mar. 28) J. E. S. Morley, J. H. Becton, K. C. Box, W. G. Webb, L. Hartley, J. E. Hudson, D. Bird, J. E. Williams, E. F. Cooper, H. Dowson, T. M. P. Spencer.

R. J. W. Le Fevre, Ph.D., D.Sc., F.I.C., is granted an hon. commn. as Wing Cdr (Mar. 25).

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Feb. 5) L. E. Pierard; (Feb. 29) G. E. Evington; (Mar. 1) G. W. Stallard, P. C. Foster; (Mar. 2) E. J. L. Ross; (Mar. 3) S. R. Norcott, E. T. McC. Routledge; (Mar. 5) A. C. H. Bircham, S. Cleobury, R. S. Craddock; (Mar. 8) W. M. Barber; (Mar. 11) C. Zerenner, L. A. Combes; (Mar. 13) H. W. Smith; (Mar. 14) G. Davis; (Mar. 15) B. S. B. Baylis, E. S. Michael, D.C.M.; (Mar. 17) J. S. Downward; (Mar. 18) J. H. Lewis, R. P. Bulton, H. R. Gray, J. R. A. Savidge, W. E. Cater; (Mar. 19) B. P. Beamish; (Mar. 21) L. A. Goss, R. J. Sayle, R. H. R. Davies, J. W. Whitmarsh; (Mar. 22) P. A. X. Gaugain; (Mar. 24) G. W. Spiers; (Mar. 25) W. F. Booth, D. F. Burt, J. C. de H. Vaizey; (Mar. 26) B. H. Wood; (April 7) A. Cave; (April 8) J. I. Eadie, L. F. Hartje; (April 15) G. I. Thorman.

P/O. on probn. R. Scott is confirmed in his appt., Dec. 10, 1940, and promoted to war substve. rank of F/O. (Feb. 6).

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Feb. 7) L. W. Trackwell; (Feb 21) S. W. Lawson.

P/O. H. L. Cooper, A.F.C., is granted war substve. rank of Sqn. Ldr. (July 15, 1940).

P/O. E. J. Fawdry is granted war substve. rank of Flt. Lt. (June 15, 1940).

The follg. P/Os. are granted war substve. rank of F/O.:—(April 1, 1940) E. A. Stockwell; (Aug. 14, 1940) H. B. Browning; (Aug. 24, 1940) J. V. Newson; (Nov. 6, 1940) A. W. Robertson; (Nov. 19, 1940) H. L. Seligman, N. M. Ffrench; (Dec. 6, 1940) J. S. Whitham; (Dec. 16, 1940) V. A. Short; (Jan. 26) P. J. Sykes, G. W. Houghton; (Jan. 28) R. G. Wilsdon; (Feb. 9) D. M. Johns; (Feb. 15) R. B. Whittingham.

The follg. are transfd. to Technical Branch:—

**SYNTHETIC AIR FIGHT: A high-speed electric model becomes the target for a Boulton Paul 4-gun practice turret.**

# SERVICE AVIATION (Continued)

F/Os': (April 24, 1940) A. McLellan; (May 6, 1940) E. I. R. MacGregor. F/O. on probn.: (Dec. 16, 1940) D. W. Mair. P/Os. on probn.: (June 22, 1940) L. H. Mansell (since promoted); (June 24, 1940) J. H. Bond; (June 25, 1940) J. G. Halliday; (Aug. 20, 1940) P. Bailey; (Oct. 1, 1940) F. Y. Pattern; (Oct. 3, 1940) L. G. Patmore; (Oct. 25, 1940) C. D. Short; (Nov. 11, 1940) A. S. Mohan; (Nov. 25, 1940) L. T. A. Andrews; (Dec. 1, 1940) B. F. Blakemore; (Dec. 7, 1940) T. S. Dutton, J. R. Burges; (Dec. 8, 1940) E. S. Sherwell; (Jan. 1) R. Davison, H. J. G. Garrity; (Jan. 15) I. C. I. Lamb; (Jan. 18) N. C. Cordingley; (Jan. 24) C. F. Aniere; (Feb. 2) K. S. Lockie, H. J. M. Maxey, L. W. Meyer; (Feb. 5) S. M. Martin; (Feb. 10) D. Newton, R. E. Skelley, G. P. Rawlings, D. G. Cooper, T. I. Cameron; (Feb. 11) H. T. Chandler; (Feb. 17) D. L. Breeden, H. H. Lampitt, H. J. Wildbore.

Flt. Lt. E. W. Carmichael takes rank and precedence as if his appt. as Flt. Lt. bore date July 10, 1940. Reduction to take effect from Mar. 4.

The follg. P/Os. on probn. relinquish their commns. on account of ill-health:—(April 12) F. G. Woodhams; (April 14) W. L. Ferrier; (April 16) R. R. Davies.

The follg. resign their commns.:—P/Os.: (April 5) R. S. Jones; (April 12) E. W. de T. Prevost. P/Os. on probn.: (April 9) F. J. Hartland.

The commns. of the follg. P/Os. on probn. are terminated on cessation of duty:—(April 1) L. V. Armstrong; (April 7) J. Cohen, A. C. Minassian.

*Meteorological Branch.*

Act. P/O. on probn. W. Wiseman is graded as P/O. on probn (April 1).

*Training Branch.*

The follg. are granted commns. for duration of hostilities as Act. P/Os. on probn.:—(Feb. 1) A. H. Adams, A. S. Alcock, C. F. Andrews, T. R. Atlay, W. S. Aulton, H. Banks, F. Binns, T. H. Bisgood, L. G. Bond, W. E. Boulter, V.C., R. E. Burgess, E. O'D. Cheshire, C. W. Collins, H. B. Coupar, A. B. Croskin, H. J. Davies, J. Day, C. G. Edmett, H. A. Egerton, G. W. Foley, O. Fox, W. T. Franklin, C. C. Gardner, E. Greaves, H. J. Hackwill, W. S. Hardy, L. W. Heath, H. Howarth, G. F. Hughes, A. H. Jenkins, F. T. Jenkins, H. H. Kealey, G. E. Knight, T. A. M. S. Lewis, T. E. Lindfield, E. A. Lingard, C. A. MacEacharn, W. R. Mason, H. W. J. Miles, J. Newhill, C. P. H. Palmer, R. T. Phillips, D. C. G. Plank, W. T. Plant, W. P. Powell, M.C., D.C.M., M. A. Reid, A. Rex, H. Richards, T. C. Riley, H. L. Rink, F. N. G. Ross, H. C. Sanderson, W. G. Seward, A. Sharman, E. O. Simms, J. T. Smith, L. Spencer, J. G. H. Stewart, D. J. Taylor, T. V. Thresh, E. P. Tomkinson, C. H. Townend, R. G. Turner, S. P. Tyzack, V. Waddilove, W. F. Warcup, H. B. Webster, O. M. White, G. A. Williams, H. H. Williams, O. Williams; (Feb. 19) H. C. Molony, O.B.E., T.D.; (Feb. 21) G. C. Gibson; (Mar. 4) K. B. G. Cossar, G. K. Donald, C. G. S. Harden, J. B. Lister, T.D.; (Mar. 6) W. H. McCrea; (Mar. 8) J. W. Wilson, M.C.; (Mar. 11) K. Meltanby; (Mar. 17) W. D. Thomas; (Mar. 18) T. Taig; (Mar. 21) P. H. Podd, C. H. Westwater; (Mar. 22) C. F. Linnitt; (Mar. 24) F. J. Jeanes, A. A. Miller; (Mar. 25) W. R. M. Caff, H. J. Davies, K. R. Imeson, A. E. Lovett, G. C. Penney, F. Reynolds, L. R. Spensley, J. D. B. Williams; (Mar. 26) G. W. Bishop, W. Bridgstock, W. J. Halliday, R. H. Hopkins, J. W. Judge, C. G. Moore, J. G. Nuttall, G. L. Opperman, J. H. Overall, T. H. Palmer, C. A. Rudd, F. D. P. Smith, A. Wetherill, F. Wheeldon, A. P. Whitehead, C. L. Widlake; (Mar. 27) C. W. S. Averill, W. N. Bicknell, F. N. Bolton, L. B. Clarke, S. C. Douglas, F. Duffy, R. W. Dutton, H. D. Evans, L. J. Evans, G. G. Grose-Hodge, P. F. Harrop, R. C. Jack, C. W. Jenner, R. P. John, H. W. Johnson, A. K. Kibbler, J. D. B. Manning, E. C. Millington, S. Moses, H. Sheppard, G. V. Sutton, J. B. Tainton, L. J. Thompson, G. Van Praagh, J. Welsby, C. H. Wild; (Mar. 28) G. W. T. Garrood, A.F.C., S. B. Graham, F. T. Jackson, T. C. Lees, J. W. Lockey, E. H. Lockwood, C. F. Paine, W. E. Rees, J. Robertson, H. W. White, Sir A. Whitten Brown, K.B.E.; (Mar. 30) G. A. Allen, E. Belbin, A. S. Benton, A. Binns, H. Blackburn, A. S. Bradburn, O. S. Brown, R. G. Burton, S. R. Cave, L. Colquitt, W. Cox, O. A. Crow, A. R. Driessen, L. J. Dyer, L. E. Edwards, H. C. Evett, A. Firth, R. M. Fletcher, C. G. Fraser, H. S. Goodby, J. Heys, H. W. Higham, C. Hitchings, J. C. G. Gilbert, W. Ibeson, H. J. Long, F. C. Morris, H. Mottershaw, R. J. Moyse, H. J. Padmore, A. J. Price, V. C. E. Rickwood, E. J. Short, A. Siddall, S. J. Thomsett, O.B.E., R. B. Thompson, H. B. V. Vaughan-Evans, F. R. Watkins, H. H. Watkins, N. S. Whitehead, J. W. Winter; (Mar. 31) A. E. Baker, D. A. Barclay, R. Birkenhead, M. D. Black, A. J. Booth, J. G. Brown, B. Cartwright, C. Chegwidden, J. W. G. Covernton, J. U. Creigg, E. De Grey Seaman, M. G. Down, E. J. Edward, W. E. Forrest, F. W. Gill, F. D. Holder, T. Hall, H. Huxley, A. E. Jarman, G. R. Judge, H. Lord, E. Mallinson, T. Mitchell-Fox, D. C. Morgan, W. G. Norden, R. E. T. Pratt, L. V. M. Price, W. W. Pritchard, T. C. Rising, A. R. Robertson, C. E. Robinson, G. H. Rowse, A. Senior, E. Silk, W. H. Teasdale, W. J. Tempest, D.S.O., M.C., A. K. D. Thompson, J. Wedgwood, C. J. B. Williamson; (April 1) T. W. Attwell, E. R. C. Donati, E. J. R. Hack, J. E. Harbach; (April 2) J. C. Gamaa, R. H. Horsley.

*Equipment Branch.*

The follg. are granted commns. for duration of hostilities as Act. P/Os. on probn:—(Mar. 28): Ldg. A/C.: J. M. Johnston, L. F. B. Purssell, A. R. P. Shield.

The follg. P/Os. on probn. are confirmed in their appts. (Nov. 9, 1940) and promoted to war substve. rank of F/O.:—(Jan. 8) S. L. Swain; (Jan. 23) E. W. Mason, R. E. Percival.

P/O. on probn. W. G. Holmes is confirmed in his appt. (Nov. 21, 1940) and promoted to war substve. rank of F/O (Feb. 11).

P/O. on probn. W. R. Gibbs is confirmed in his appt. and promoted to war substve. rank of F/O. (Feb. 19).

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.—(Jan. 18) K. H. Williman; (Jan. 22) J. H. Bidlake; (Feb. 1) O. R. Turner; (Mar. 7) W. G. Nelson; (Mar. 21) V. H. Sweeting, P. B. L. Falk, D. C. Peters, D. M. R. Piesse, D. J. C. Prizeman; (Mar. 21) G. H. Roberts, D. A. Solomon, H. S. Thomson.

The follg. P/Os are granted war substve. rank of F/O.:—(July 15, 1940) J. F. Keith; (Aug. 16, 1940) A. N. Dupont; (Sept. 17, 1940) E. H. C. Hilton, J. B. McGlade, G. M. Beer, E. J. W. S. Foote, W. D. Hutchings, R. H. Cain, I. Morrell; (Jan. 22) J. P. Turtle; (Nov. 24, 1940) C. W. Rea; (Dec. 1, 1940) D. Mitchell; (Jan. 27) P. Yorke; (Feb. 12) C. B. R. J. B. Curtis; (Feb. 21) R. G. G. Ponsonby.

P/O. on probn. D. M. Tyringham relinquishes his commn. on account of ill-health (Apr. 5).

*Accountant Branch.*

A/C.2 R. A. J. Murison is granted a commn. for duration of hostilities as Act. P/O. on probn. (Mar. 28).

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Jan. 25) C. V. Priest; (Feb. 15) L. Johnson; (Mar. 7) L. B. Carter, L. R. Hawkins, H. J. O. O'Mahony, E. C. Shaw, R. K. Fairbrother, J. E. Hawken, F. W. C. Clarke; (Mar. 29) W. Bestwick, S. McA. Beswick, H. H. N. Drysdale.

P/O. H. C. Scarlett is granted war substv. rank of F/O. (Dec. 2, 1940).

*Medical Branch.*

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Jan. 23) M. C. T. Reilly, M.B., B.S.; (Mar. 5) R. Piper, M.B., B.Chir., M.R.C.S., L.R.C.P., J. E. T. Strickland, M.R.C.S., L.R.C.P., H. Whittle, M.B., Ch.B.; (Mar. 12) A. B. Rowlands, M.B., Ch.B.; (Mar. 26) G. Macnaughtan, M.B., Ch.B.

*Dental Branch.*

The follg. are granted commns. for duration of hostilities as F/Os.:—(Mar. 21) L. W. Ling, L.D.S., K. Richards, L.D.S., G. R. Styles, B.D.S., W. G. Hall, L.D.S., F. R. Morrey, L.D.S., C. E. Sage, L.D.S., J. Watson, L.D.S., O. S. Bennett, L.D.S., M. H. J. Simpson, L.D.S., R. C. Andrews, L.D.S.

F/O. C. W. A. Carmichael L.D.S. is promoted to war substve. rank of Flt. Lt. (Nov. 28, 1940).

*Chaplains Branch.*

The follg. are granted commns. for duration of hostilities with relative rank of Sqn. Ldr.:—(Mar. 1) Rev. J. Sumner, Rev. M. T. E. Hagarty, Rev. I. E. Douglas-Jones, B.A.; (Mar. 3) Rev. N. Cosbett; (Mar. 4) Rev. A. H. Procter; (Mar. 6) Rev. W. Corbishley, B.A.; (Mar. 10) Rev. A. M. Catley; (Mar. 11) Rev. J. A. Warner, B.A., M.A.; (Mar. 18) Rev. H. W. R. Lillie; (Mar. 25) Rev. E. R. Evans, B.A., Rev. J. R. Rycecart, Rev. W. B. Clarke, Rev. L. V. Peacock.

## *Auxiliary Air Force*

*General Duties Branch.*

F/O. A. J. Rawlence is promoted to war substve. rank of Flt. Lt. (Jan 16).

P/O. J. C. McNeill is promoted to war substve. rank of F/O. (Feb. 15).

*Balloon Branch.*

P/O. F. N. Stocker is granted war substve. rank of F/O. (Dec. 10, 1939).

F/O. J. A. Nicholson resigns his comma. (Apr. 6).

## *Women's Auxiliary Air Force*

The follg. are apptd. Assist. S/Os.:—(Apr. 5) A/CW.2 R. Fisher-Rowe, A/CW.2 K. M. Fuller, A/CW.2 N. Gwinnet-Sharp, A/CW.2 J. E. Harvey, A/CW.2 P. M. Heath, Sgt. D. M. Hunter, A/CW.2 M. W. Spence, A/CW.2 J. G. Wakeham, A/CW.2 K. M. Wright; (Apr. 7) A/CW.1 J. M. Andrews, A/CW.1 J. S. Boddam-Whetham, Sen. Sgt. H. J. Compton, A/CW.1 H. M. Craven, Sgt. S. Eddowes, A/CW.1 L. F. Erskine, A/CW.2 E. A. Fords, Cpl. O. M. Malet, Sgt. J. M. Maule, A/CW.2 C. H. Muir, A/CW.1 M. G. Overend, A/CW.1 J. A. Palmer, Sen. Sgt. B. B. Parker, A/CW.2 B. D. Powlett, A/CW.1 K. McG. Robertson, Sgt. E. Talbot, Cpl. K. C. F. Williamson, Sen. Sgt. M. I. Wilson, Cpl. U. G. Wilson, Sgt. K. Wooldridge.

The follg. Assist. S/Os. relinquish their appts.:—(Jan. 24) M. H. D. Russell-Roberts; (Mar. 22) M. L. Martin.

Assist. S/O. K. E. Vickers relinquishes her appt. on account of ill-health (Mar. 1).

**THIS CIVILISATION: A ground crew of a R.C.A.F. fighter squadron practising the performance of aerodrome operations while wearing gas masks.**